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ABSTRACT

This program is designed to be an extension of the regular curriculum providing preschool children with a firm foundation and life-long appreciation for space and space-related topics. The program delivers both classroom and at-home family activities which emphasize age-appropriate language, math, art, science, nutrition, and health concepts within a space theme. Included is a statement of goals and philosophy, and directions on the use of the curriculum extension activities. The main part of the document "Living in Space" includes 40 units (20 of which are family activity units) divided into three sections ("What's in the Sky?": "Traveling in Space"; and "Living in Space"). A storybook, "The Youngest Astronaut," which was written to relate to the materials is included in the appendixes. The format of each unit includes a description, an activity, a background note, unit elements, and materials and resources. Appendices include: (1) a play for children; (2) a statement about math and science for preschoolers; (3) a bibliography of more than 300 resources; (4) a list of NASA teacher resource centers; (5) lists of participating Head Start programs; and (6) a selection of NASA photographs. (CW)

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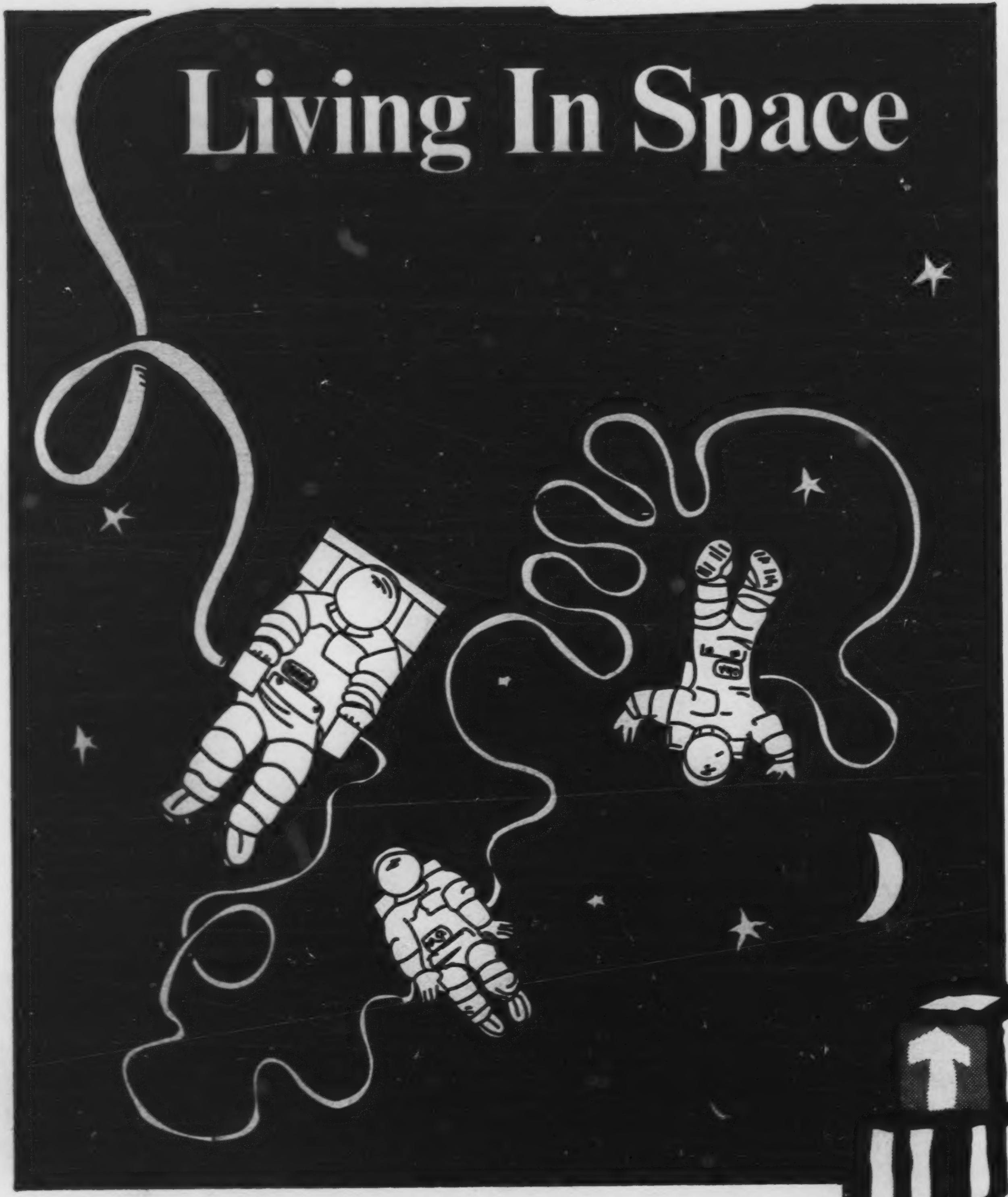
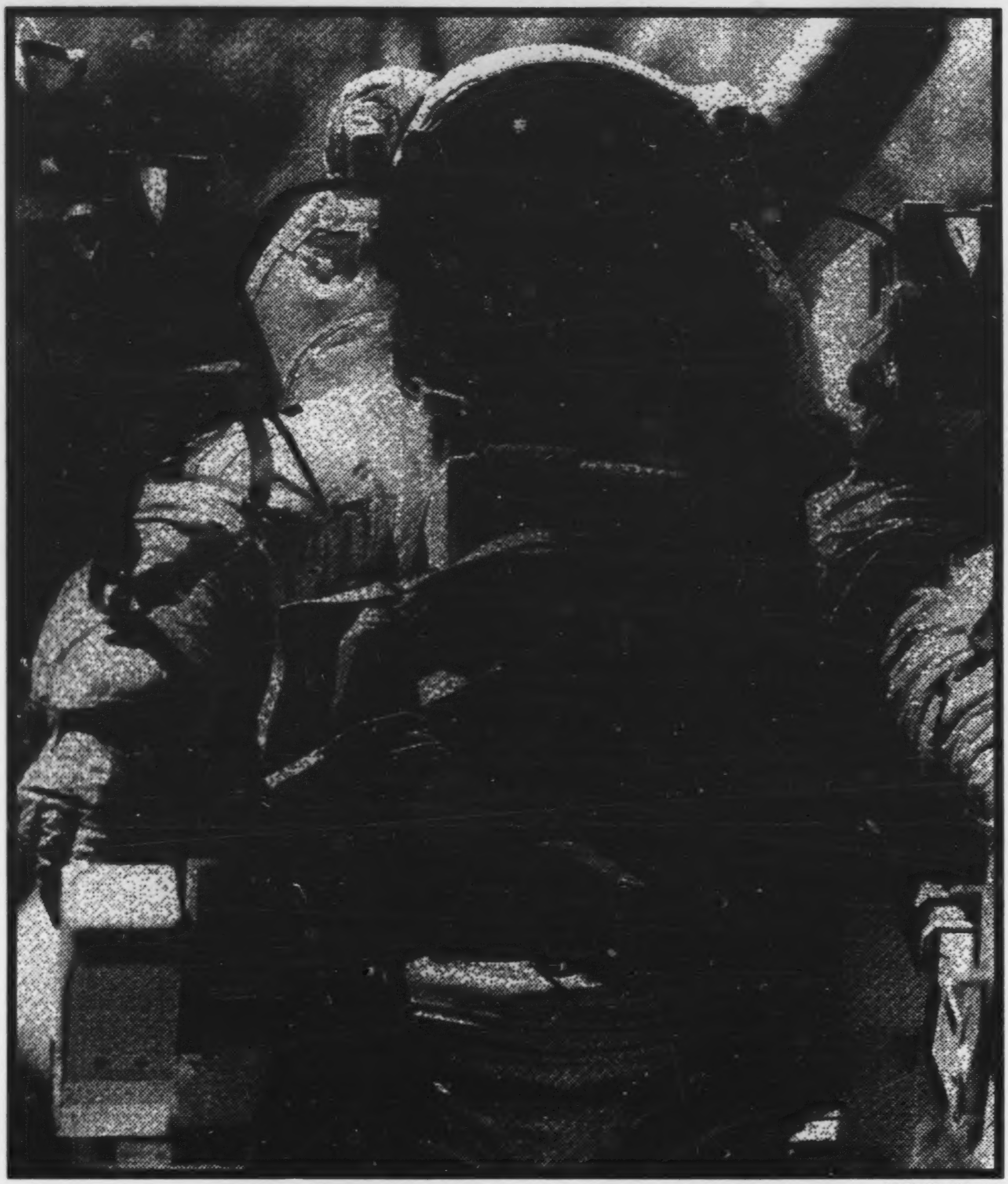
Living In Space





(NASA Photo)

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HHS Grant Information

HHS Grant Information

It is with pride and enthusiasm that we provide Head Start programs with this educational program for preschool children which features the first steps in learning about space.

This material was developed by the Young Astronaut Council with the involvement of an interdisciplinary advisory group and the help of Head Start parents and staff throughout Florida in field-testing all aspects of the material.

We expect this program to serve as a prototype for additional curriculum enrichment modules based on a variety of subjects which we hope to make available to Head Start programs from time-to-time. *Living In Space* presents aerospace information and activities for children and parents in a way that allows both age groups to learn together.

I would particularly like to acknowledge the contribution made by Mary S. Lewis, HHS project officer for this special effort. Dr. Lewis is a fervent advocate for the "best" for young children and she has gone beyond normal expectations to ensure that *Living In Space* would be the best of its kind.

E. Dollie Wolverton

E. Dollie Wolverton, Chief
Educational Services Branch
Head Start Bureau
Department of Health And Human Services

Foreword

The Young Astronaut Council and the Administration For Children, Youth And Families are excited about the development of this preschool, aerospace, educational program for young children. Preschoolers, their parents and their teachers, indeed, all of us are on the brink of dramatic changes in the way we view the world and how we relate to it.

If the children we teach today are to survive and succeed tomorrow, it becomes our obligation to equip them not only with appropriate knowledge and skills, but also with a love for Earth and all who share it.

This program delivers opportunities to do both. Developmentally appropriate math and science activities have been infused with the positive motivation that space and space-related themes provide for youngsters. Similarly, age-appropriate socialization skills are promoted through an understanding of a space environment.

The *Living In Space* materials provide a first step for children whose lives will be lived mostly in the Twenty-first Century. The Young Astronaut Council and Administration For Children, Youth And Families welcome your use of this program and are proud to be a part of this collaborative effort with children, parents and teachers.

T. Wendell Butler
T. Wendell Butler
Executive Director
Young Astronaut Council

Dodie Livingston
Dodie Livingston
Commissioner,
Administration For Children,
Youth And Families
Department of Health
And Human Services

Foreword

Acknowledgements

Acknowledgements

The Young Astronaut Council and the Head Start Bureau wish to thank the following individuals and organizations for their contributions to *Living In Space*.

The Preschool Panel of Experts

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Mr. Raymond Corey, Chief Educational Programs Staff, Kennedy Space Center, Florida

(NASA Photo)

(NASA Photo)

Introduction

The Young Astronaut Program (YAP) is a privately sponsored, non-profit, educational organization established by the White House in 1984 to develop and deliver high-quality, space-related, curricular materials to elementary and junior high school students.

Living In Space extends a program of study to preschool children and provides them with a firm foundation and life-long appreciation for space and space-related topics. The Young Astronaut Council (YAC) was funded by the Department of Health and Human Services, Office of Human Development, Administration For Children, Youth And Families to design a preschool, aerospace, curriculum, enrichment program.

This *Living In Space* program delivers both classroom and at-home family activities which emphasize age-appropriate language, math, art, science, nutrition and health concepts within a space theme. A collaborative panel of early childhood, aerospace and Head Start experts ensured that the quality and integrity of the curriculum materials were safeguarded.

The Panel of Experts who provided guidance and direction to the project determined that the curriculum would be designed around three basic tenets:

- Developing thinking skills in preschool children is important.
- Promoting the scientific method of inquiry for preschoolers is beneficial.
- Providing a space theme in which to develop thinking skills and promote the scientific method of inquiry is appropriate.

The Importance Of Thinking Skills

Children's approach to the world at this age is essentially motivated by their sense of curiosity and wonder. In these early years of understanding, children express their thoughts through observation, manipulation, exploration and experimentation. It is important to support and encourage these natural tendencies and to offer opportunities which develop constructive, critical and creative thinking.

The Importance Of The Scientific Method Of Inquiry

Children need a learning environment that allows them to observe and express their ideas and act upon their environment. This serves as a basis for creative thought and critical thinking. Appropriate skills for three, four and five-year-olds are describing things within their environment and developing questions about their environment.

These children also like to explore their world by hands-on activities. They should be free to explore and organize their experiences based on their perception, classification and interpretation of activities. Repetition is a necessary step in all science and is extremely important to preschoolers as they verify their experiences.

At the same time, parents, teachers and other adults in the child's world should become comfortable with a certain amount of natural ambiguity which exists. As an example, adult responses to a child's "why?" questions may allow for different answers, all of which may be valid.

(NASA Photo)

(NASA Photo)

The Relevance Of Using A Space Theme

Outer space is a topic that is relevant to our future, promotes a universal sense of wonder and reinforces the idea that we all share one planet. Early childhood teachers, parents, grandparents and children all find the subject of outer space exploration fascinating. Space exploration weaves together all aspects of our experience and generates an enthusiasm to learn more. Space adventure also creates a new hero system for our children. Achievements and success are based on knowledge, skill and dedication to a common cause: the betterment of life for all people.

The objectives of the *Living In Space* module generated by these beliefs are age-appropriate and in concert with early childhood education practices. They are:

- Promoting inquiry on the part of the child.
- Encouraging parents and teachers to accept questions from children.
- Fostering creative growth of mathematics and science concepts on the part of children.
- Providing opportunities for children to explore ideas about outer space.
- Developing the settings for children to play out ideas which have been presented.
- Enjoying teaching and learning through the use of space-related activities.
- Integrating all appropriate, early childhood education components into aerospace activities.

These objectives are integrated with the knowledge that learning is a continuing process with many opportunities to verify experiences and make mistakes. Individuals learn by making mistakes. Even after initial formation of a concept, learning continues as the concept is refined through trial-and-error testing. As children mature, their knowledge of concepts becomes more complicated and sophisticated. Learning, then, is a spiraling continuum of experience.

Some concepts within the program are beyond the grasp of three to five-year-old children. This is important to remember when working with the "Traveling in Space" section. Air, gravity and weightlessness are too difficult for preschoolers to understand. The benefit of these topics lies in exposing children to the words associated with the concepts. They become familiar and comfortable with parts of a concept which they later will use and build upon.

All activities focus on air and space adventure and are developed around the preschooler's six senses: sight, taste, touch, smell, hearing and muscle movement, or kinesthetic. A total of 30 core activities present the teaching staff and classroom volunteers with opportunities to develop space-related activities which permeate children's total classroom environment.

The program capitalizes on sensory learning development to help children explore the three enormous distinctions which exist between life on Earth and life in outer space:

- There is a lack of gravity in outer space.
- It is necessary to take one's Earth environment to outer space to survive.
- Spatial relationships beyond Earth's gravity do not correspond to Earth.

(NASA Photo)

(NASA Photo)

Curriculum activities facilitate exploration of these differences, but also encourage exploration of similarities among people, regardless of environment.

Parents play a significant role in the *Living In Space* module. Not only should they receive training to understand the importance and relevance of the activities to their children, but a large portion of the curriculum encourages the total family to do projects at home. Each classroom activity is accompanied by a similar Family Activity. The entire family may participate at home by reinforcing and extending classroom activities and by interacting on a one-to-one basis with their children.

Parents also are viewed as classroom partners in the project and should be involved with developing resources, making arrangements for classroom, outdoor and field trip activities, as well as providing a smooth transition into the elementary school where, hopefully, the child and his parents will become involved with the progressively advanced stages of the Young Astronaut Program.

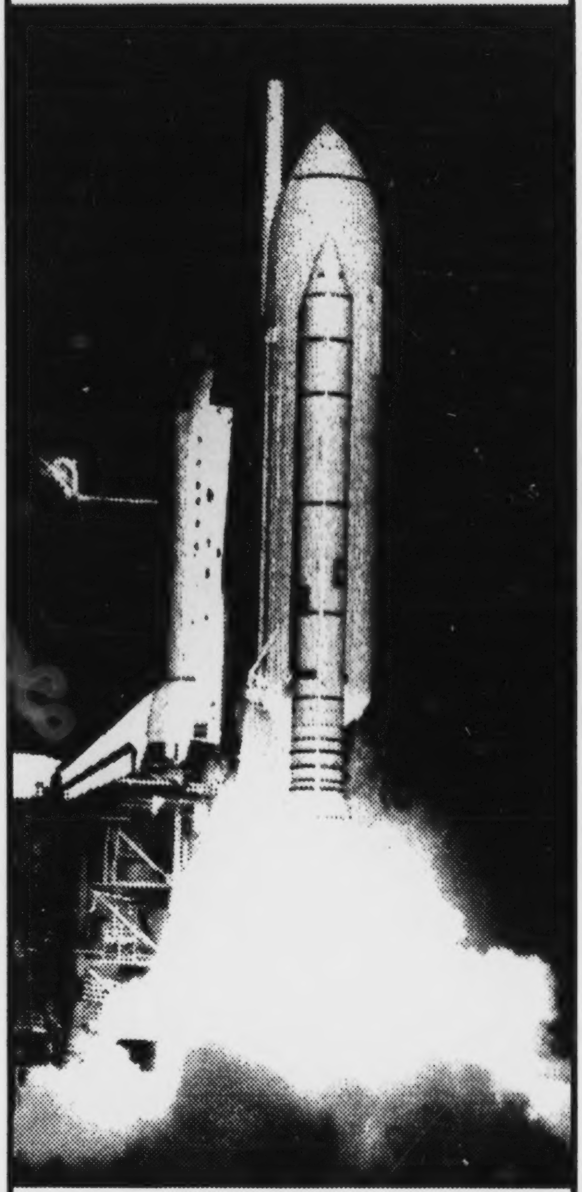
A storybook, "The Youngest Astronauts," has been written to correlate with module activities. The story describes the first two children in outer space, Kim and Mario, who, together with Mario's mother, go through a sequence of preparing for their journey, living in a space station and returning to Earth.

The Young Astronaut Council hopes that you and your children have fun using the *Living In Space* activities. The need to begin exposing preschool children to critical thinking skills and the scientific method of inquiry has been made painfully obvious by recent studies. The Council believes this age-appropriate, non-stressful curriculum will establish a life-long appreciation for math and science and promote a love for Earth and all who share it. YAC is proud to be a partner with you in this endeavor.

The Council is very interested to hear comments and suggestions about the *Living In Space* preschool curriculum. In addition, if users have expanded activities or tried something different, YAC would like also to hear about it. Correspondence should be sent to: Young Astronaut Program, Preschool Project, P.O. Box 65432, Washington, D.C. 20036.

Jim Matlack

Director, Early Childhood Programs,
Young Astronaut Council.



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How To Use The Curriculum

These materials are designed to be added to your existing curriculum activities. This does not replace your curriculum, but rather extends and enriches what you are already doing. The program focuses on aerospace, a new concept in the preschool world and thus different from other themes usually found in curriculum materials. Its newness will make it challenging to teachers and parents alike since it offers information about life on our newest frontier where few have ever been!

We suggest that both teachers and parents in your program be given an opportunity to hear about *Living In Space* and to participate in the decision to use these activities. This means that the teaching staff will have to gather some new materials, toys, pictures, books, resource people and information in order to carry out the activities. Both teaching staff and parents can make good use of the unit, if they are open to learning new things and are willing to try activities focusing on new concepts. Neither parents nor teachers should be uncomfortable if they are not well-versed in the subject matter or know the answers. The materials are developed specifically to mitigate this common problem.

We see three things as very necessary for using this curriculum. They are time, space and creativity. Let's begin with time.

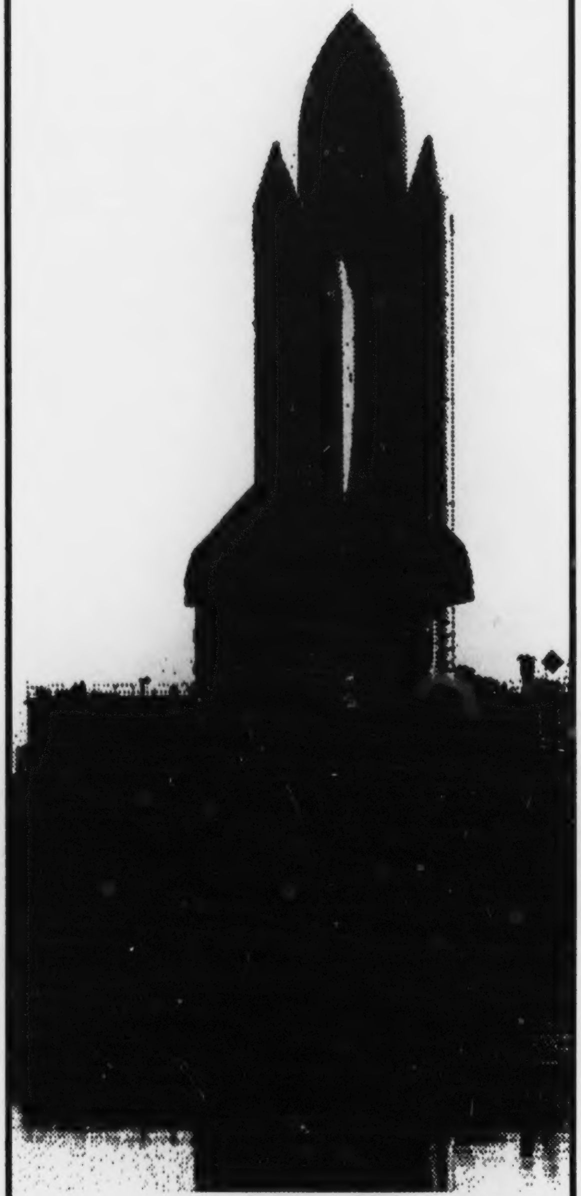
Time: These units can be done one each day for a month or they can be done a little every day for a week over the whole year. We think that the more time the children have to play out the ideas and experiences, the more they will learn from each unit in the program and the more they will come to understand the concepts being presented.

If you decide *Living In Space* will be your focus for a whole school year, we think the material will be better understood by the children than if you do everything in a month or six weeks.

Space: Each unit specifies the materials, resources, equipment and space needed. However, to get the maximum benefit for the children, you need to provide as much space as possible for the children to play at being astronauts, pilots, mission specialists and other aerospace people. Children need space so they can build spacecraft and orbiters. The housekeeping or dramatic play area should be big enough to turn into the "middeck", where astronauts live in outer space. There should be extra space to store the space-related, dress-up clothes and other items for dramatic play.

There should be lots of space on your walls for aerospace pictures. The more pictures of life in outer space, the more children will have to think about, talk about and dream about. You will need space on table tops for play with small table blocks, Lego, shadow boxes, space boxes, as well as art materials. We want you to provide as many opportunities as possible for children to express their thoughts in words and on paper through drawing, feeling and painting.

Creativity: Although the units in this program are self-explanatory, they can be expanded a hundred-fold by your ideas and creativity. It was a very creative teacher in Pensacola, Florida, who designed the transparent plastic spacecraft, blown up by a fan, sealed with duct tape, with a door kept closed by Velcro. Each unit can lead to more activities which expand and extend the opportunities for children to absorb the concepts.



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(NASA Photo)

Each time the children brush their teeth, eat a snack, throw away trash, show consideration for others or use directions, the creative teacher will compare those actions to the ways people in space behave. Thus, the themes of good health practices and concern for others, for example, are underlined in the daily routines of the classroom.

To help you begin your use of these materials, we are including a storybook, "The Youngest Astronauts." This story about Kim and Mario's adventure in outer space contains the basic concepts to be found in the 30 units. We suggest you read the story to your children first to whet their interest and then remind your class of Kim and Mario's activities as you go through the units. Please take the story out of the package, make cardboard covers or put it in a three ring binder and you will have a book to use.

Lastly, each unit comes with family activities to be given to the parents of the children in your class. We know that children learn a great deal in preschool. We also know they will learn much, much more when their families reinforce what is being taught at school. The activities suggested in the "Family Shuttle" are for the whole family to use, and they correspond to the classroom activities for each unit. In addition, we suggest you plan both parent and family field trips to museums, planetariums, airports, etc., so that staff, children and parents can all learn something new about aerospace together! Remember, outer space is the frontier for this year's preschoolers and the more we can enlarge and enrich the understanding of the adults who teach them at home and in school, the more reinforcement is provided for the children.

Getting Started

Help the *Living In Space* program become a positive experience for staff and parents from the beginning by making them feel comfortable with the curriculum format and the subject matter.

We suggest that you use the following outline to present the curriculum:

I. The core curriculum consists of two items:

a. The *Living In Space* program consists of 30 units and is divided into three sections.

1. "What's In The Sky?" consists of seven units covering objects in Earth's atmosphere.

2. "Traveling In Space" involves gravity and air movement. The three units are a bridge between life on Earth and life in outer space. We know preschool children will not understand the basic concepts involved in going from Earth to the next frontier, but we present a few units to help you talk about the transition.

3. "Living In Space" is a group of 20 units. The space shuttle and life on board the orbiter are topics of these units.

Each of these sections is introduced by a description of aerospace that relates to the units to be covered.

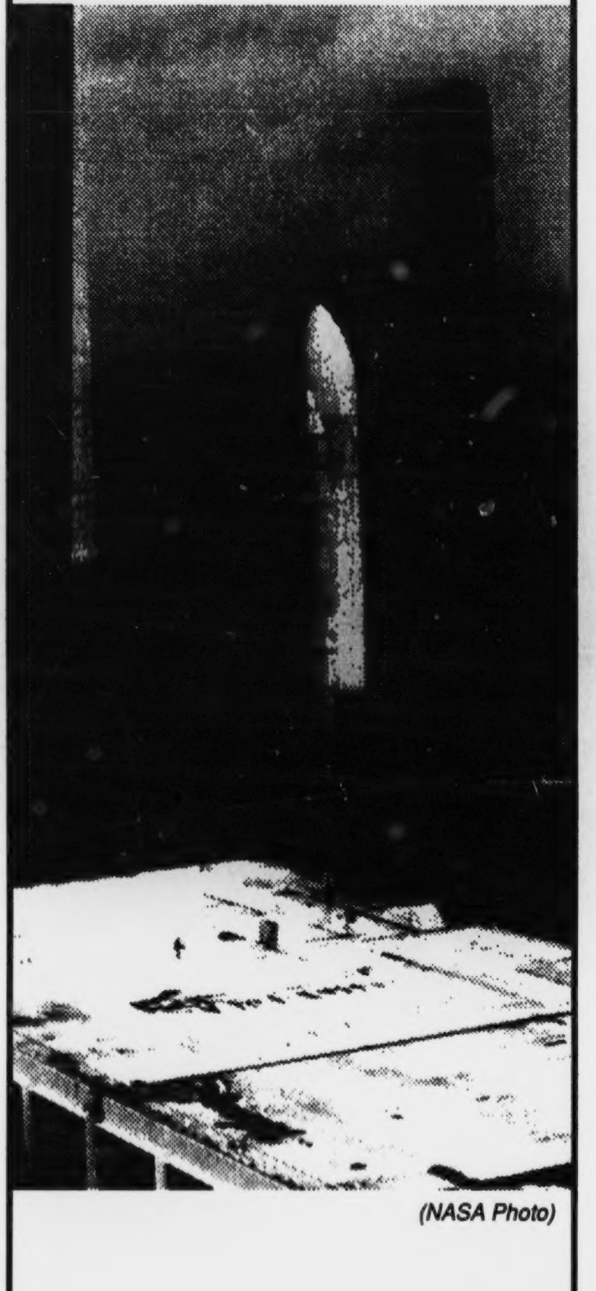
b. The storybook, "The Youngest Astronauts," was written to correspond to the curriculum materials.

II. Each unit has at least one classroom activity and a separate family activity. The family activities, called the "Family Shuttle," reinforce aspects of the classroom activities. The "Family Shuttle" should be copied and sent home for family use each week.

III. Each classroom unit follows the same format:

a. Description: establishes what will occur during the activities for the children.

b. Activity: step-by-step progression of a series of activities. Teachers may elect to do some or all of the activities.



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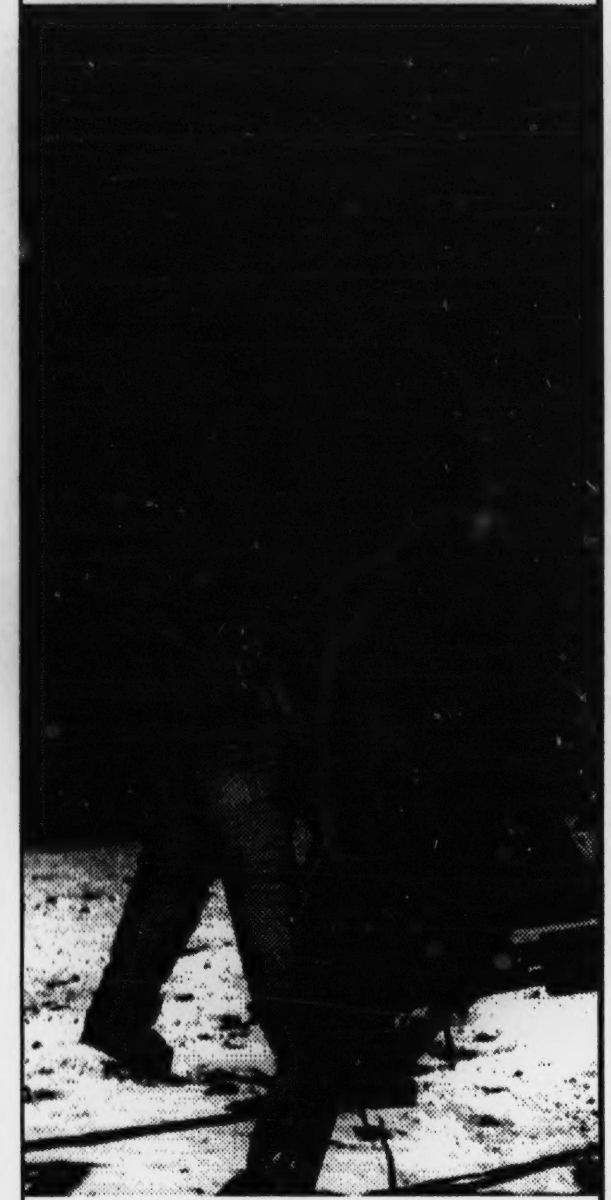

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c. Background Note: an aerospace explanation especially written for the unit to help teachers understand the aerospace concept behind the activities.

d. Unit Elements: the social, emotional, physical, self-help and cognitive skills involved with the activities are listed to help teacher planning.

e. Materials and Resources: a list to help teachers quickly identify what is needed for the activities. A complete listing of materials and resources is included as an appendix also.

IV. Each family activity follows the same pattern:

a. Background Note: this is identical to the background note supplied to the teacher for classroom activities.

b. Activity: one or more suggestions based on the classroom activities. Permits individualization of the unit for each child.

c. "Want to Give Your Child More Space to Grow?" provides additional activities which the family may do together.

d. Materials Needed: list of materials required for home activities.

Pilot groups using these curriculum materials found a number of ways to help teaching staff and parents become comfortable with aerospace as a preschool topic, and simultaneously learned more about the curriculum before introducing it to their children.

Some groups held a "make-and-take" day for teachers and parents. Materials were made for each activity and later used as models for classroom use. This helped people become familiar with the curriculum and gave them a chance to gather resources and materials for the activities.

Other groups held a parent-training day and helped parents collect all the materials which they would need to work with the family activities at home. This provided the opportunity for parents to come together and discuss the program with teaching staff, try the activities, get their questions answered and feel part of the planning process.

Some parent groups and teaching staff collected available resources and created an aerospace lending library for parents to use. Items, such as binoculars, telescopes and storybooks, could be "checked out" by parents to help them extend the family activities at home.

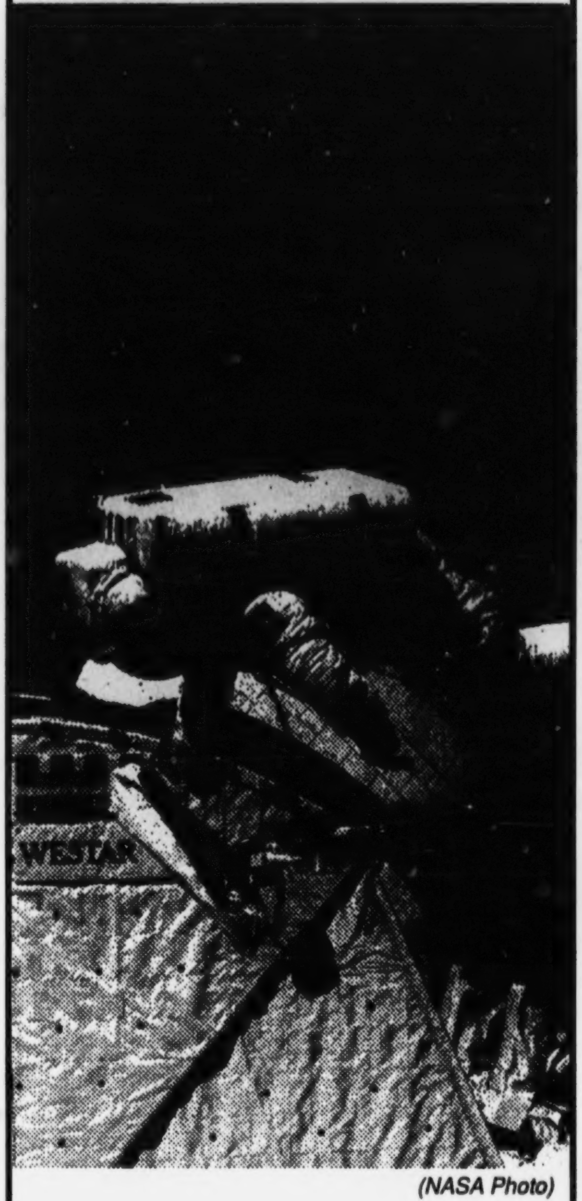
More than one group set aside a day to collect all the materials and resources which are necessary for the activities. Teachers made lists of resources, supplies and equipment which were not available, but would enhance the program. Items not available were prioritized for purchase.

Enjoyable for staff and parents was a field trip to a planetarium, air and space museum, airport or inviting an aerospace speaker to talk with the group. An evening, sky-watch party also proved a positive way to spark adult interest in the program. Local Earth science teachers, astronauts, regional NASA Teacher Resource Centers, Civil Air Patrol units and Young Astronaut Chapter Leaders are usually eager to share their enthusiasm for aerospace with interested groups.

Once teachers begin to work with the program, the enthusiasm of the children and the excitement of outer space as a topic generates a momentum which is hard to contain. Enjoy the activities and have a good journey!

Mary S. Lewis

Mary S. Lewis
ACYF Education Specialist and Project Officer



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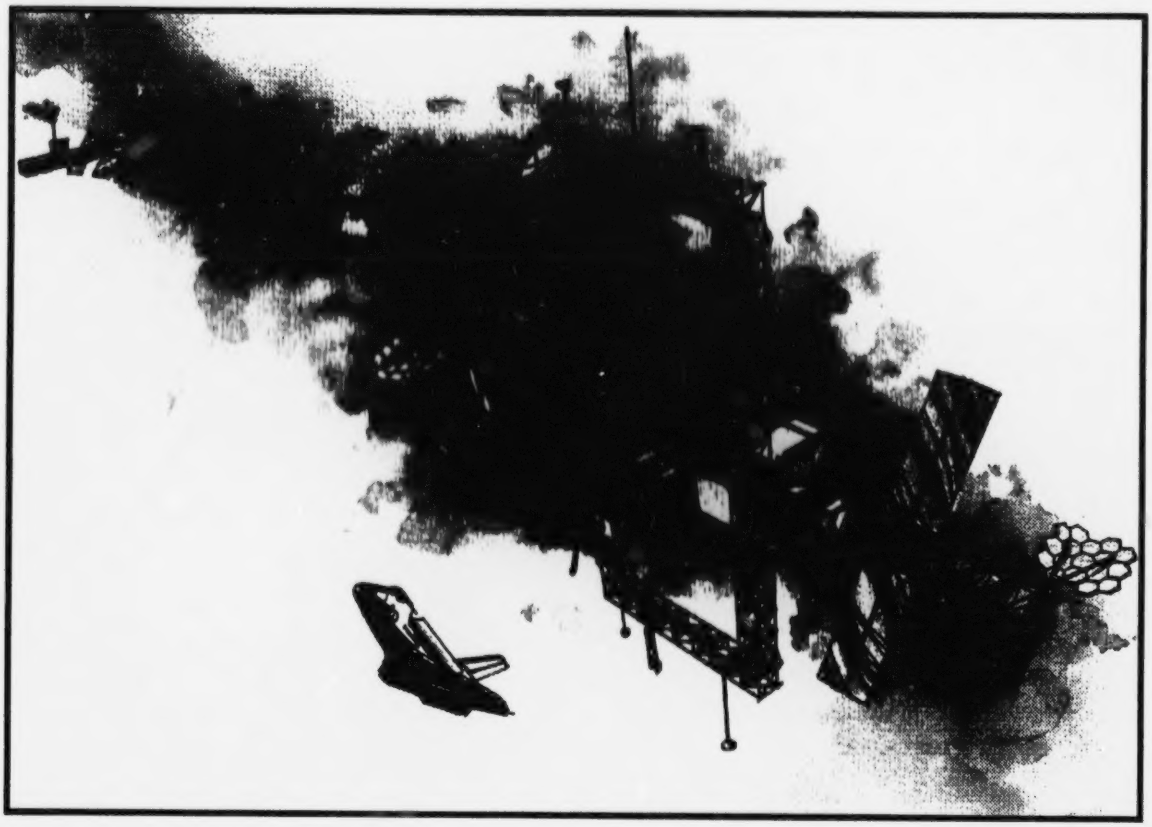
The Next Frontier



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What's In The Sky?

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What's In The Sky?

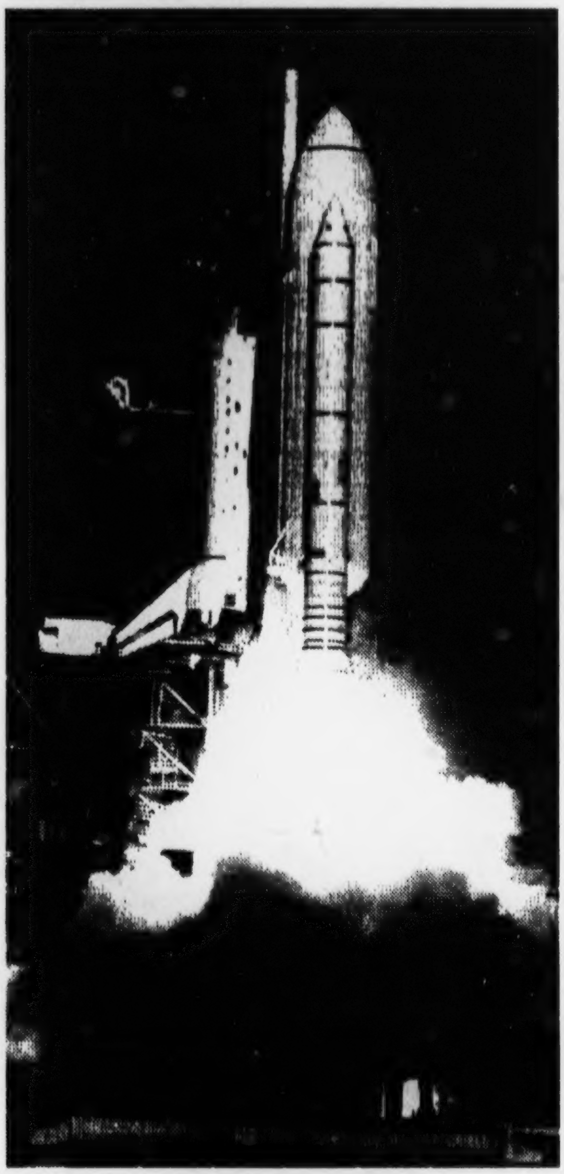
The bright glare of the Sun, the changing shape of the Moon, the flash of lightning, all are part of the experience of very young children. The sky is an object of wonder and creates many teachable moments for preschool educators and parents.

Why Study The Sky?

As the Earth provides special limits—land, mountains, water barriers, the sky defines our time, (day, night), our weather (clear, cloudy or rainy) and our sense of infinity. First, there are things in the air—clouds, rain, blue sky. There are things in space—Sun, Moon, stars and planets. Things in the air tend to affect our lives directly. Things in space (with the exception of the Sun) are objects of mystery and wonder. The Sun—maker of the day, bringer of seasons—is the reason life can exist on Earth. The Earth formed out of the cloud that made the Sun. Heat from the Sun is the engine that drives our weather. The Sun gives energy to plants which give food to animals. Our fossil fuels—oil, gas, coal and natural gas—are the residues of plants which grew with solar energy.

What's In The Sky?

The atmosphere (air) protects us from the most harmful of the Sun's radiation. In the air is the moisture that is carried and redeposited as rain and snow. All of these phenomena are part of the child's everyday experience, and they help locate the child in his or her own sense of home, community, world and universe.



The shuttle Columbia roars into the sky on its maiden flight. (NASA Photo)

Required Materials

WHATS IN THE SKY? REQUIRED MATERIALS FOR THE CLASSROOM

Things to Collect

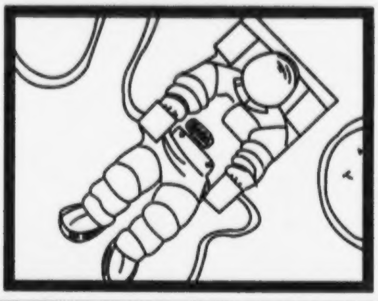
- Three-foot-square cardboard box for each child
- Pictures of day sky, night sky, outer space
- Magazine pictures (of other countries, cultures, animals, deserts, beaches, city skyscrapers)
- Quick growing seeds (grass seed or seed for parakeets)
- Brown grocery bags
- Yarn or string
- Classroom toys to resemble pretend antennae
- Paper towel tubes, plastic lids

Supplies

- Felt squares: white, yellow, gray, medium blue, light blue, brown
- Paper plates, aluminum foil
- Ivory soap powder or canned shaving cream
- Sponges
- Yellow food coloring
- Cotton balls
- Drinking straws
- Chart paper, construction paper
- Crayons, felt-tip markers, chalk, tempra paint
- Pipe cleaners
- Paper clips
- Staples, glue or tape

Materials and Resources

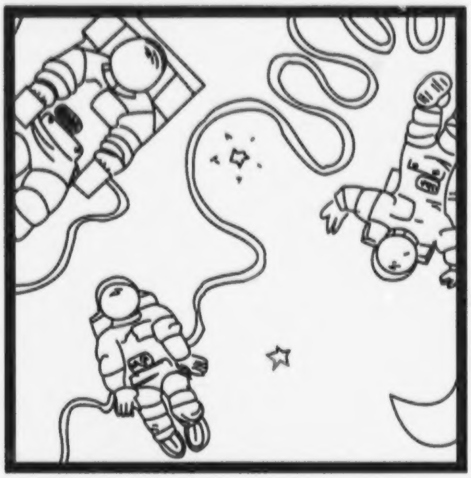
- Story about stars from Resource Bibliography
- Magnifying glass tripod (optional)
- Hoola hoop or spliced section of garden hose
- World globe
- Blue flannel board
- Space shuttle model
- Satellite models or pictures
- Real or pretend telescope, telephone, camera
- Mirror
- Flashlight
- Bristle Blocks, Tinkertoys or Legos
- Picture of a real star and a five-pointed star
- Small candle or small flashlight
- Black flannel board or construction paper
- "North Wind and the Sun" by La Fontaine
- Hole punchers (optional)



Required Materials

WHATS IN THE SKY? REQUIRED MATERIALS FOR THE FAMILY FOR THE YEAR

Paper, dark paper
Pencil, crayons
Books about outer space
Blanket
Ingredients for Sunrise Salad: 8 oz. can
    sliced pineapple, 1 c. of water, 2 oz.
    pkg. lemon gelatin, 8 oz. cheddar
    cheese cut in 1/2" x 1/4" strips.
Paper bag
Container to collect rain, ruler
Large ball
Telescope or binoculars (optional)



Wondering

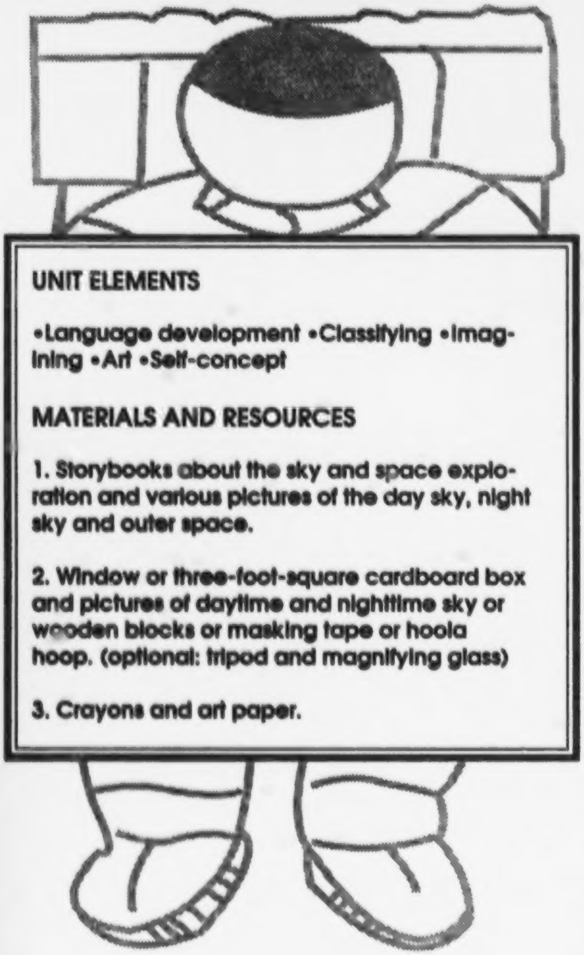
DESCRIPTION

This activity encourages children to look above them and talk about what they see. It also provides them with a quiet, private place of their own. Give them time to dream or wonder before you begin asking questions.

Imaginary concept of a voyage to the Moon by an American illustrator, G. Dore, in the late 19th Century. (NASA Photo)

ACTIVITY

1. Take a small group of children outside on a nice day. Find a place to sit and talk about the ground you are sitting on - the grass, gravel, trees and bushes that are attached to the Earth.



UNIT ELEMENTS

•Language development •Classifying •Imagining •Art •Self-concept

MATERIALS AND RESOURCES

1. Storybooks about the sky and space exploration and various pictures of the day sky, night sky and outer space.

2. Window or three-foot-square cardboard box and pictures of daytime and nighttime sky or wooden blocks or masking tape or hoola hoop. (optional: tripod and magnifying glass)

3. Crayons and art paper.

2. Lie down and look up at the sky. Ask children to name things surrounding them and talk about them. Ask them to name things that are above them that are attached to the Earth, such as tall trees and buildings.

3. Ask children to look above them for things that are not attached to the ground. (Be careful so that children do not look directly at the Sun. That is dangerous.) Explain that today we want to look at things that are not attached to the Earth. Discuss the sky and its color; discuss clouds for color, shape and movement.

Wondering

4. Ask children what they would do if they were up with the clouds. Ask if they know any way of getting up in the sky. Do they have any ideas how to stay up in the sky? How do birds feel? What do they see? What do they think they would see down on Earth if they were in the sky?

5. Take children back to their classroom and let them explore the following materials. Display storybooks with pictures of the sky, both during daytime and at night. Include space exploration pictures. Have toy airplanes, helicopters and a space shuttle with which to play.

6. Use the following suggestions to help the children make a place to wonder.

a. If a window with an appropriate view is available in the classroom, block that area and provide a seat or comfortable standing room where one child may gaze out and look at the sky. Where there is a window and no view of the sky, tape pictures of the sky or outer space to the window panes.

b. Astronauts have "rescue balls" where they go and sit until they are rescued (if they need to evacuate the spacecraft while they are in space). Although you may not want to identify your rescue ball this way, you could simulate it by using a three-foot-square (or larger) cardboard box from a grocery store. With the top cut off, lay the box on its side so children may walk or crawl inside. Paste or tape pictures of a daytime sky inside on one side and pictures of a night sky on another side and pictures of space exploration on the third available side. (This emergency vehicle

An Orbiter is removed from its carrier (747) at the Mate-Demate Facility at Edwards Air Force Base (NASA Photo) is used later during "Living In Space" Unit activities.)

c. Some classrooms have a magnifying glass recessed in a wooden tripod. If this is available, place various pictures of the sky or outer space under the tripod and block off that area with wooden blocks, masking tape or a hoola hoop (which may be used during another activity) to ensure privacy for children while they look through the glass at the pictures.

7. After children have explored the books, pictures and aviation toys, ask them if they want to gaze out of a "wonder window" or "rescue ball."

Ask them to pretend they are in the sky. Let them choose between a night sky or a day sky. Ask them to think about the sky and what they see. Suggest children name what they see. Ask them to try and imagine they are in the sky. What would it feel like? How would they get to the sky? Is it cold or warm? What does a cloud feel like? What color is a star? Could you sit down in the sky?

8. Have paper, crayons, paints and felt-tip pens available after children have finished looking out the wonder window. Ask them to share what they saw and thought about by drawing a picture. Talk about the art and stories when the project is finished. Hang artwork low enough around the classroom for all children and visiting parents to see.

9. Write stories based on children's comments on the sky. Begin saving these experience stories to use during open house events or end-of-year parent parties to share what the children have been learning.

10. Talk about space movies or TV programs children have seen. Powerful images from these movies are often recalled by children and stimulate their sense of wonder. Discuss some of their favorite characters and have children explain why they are fond of these characters.

Rescue Ball for in-space rescue (NASA Photo)

BACKGROUND NOTES

Many important discoveries and inventions are made because people allow themselves to wonder and ask questions about the world surrounding them. Obvious examples include: questioning the belief that the world was flat, that the Sun revolved around the Earth and, more recently, that humans cannot survive on the Moon.

Curiosity continues to make scientists ask questions and seek answers about the unknown. The challenge of the unknown and how it could benefit all mankind generated America's space exploration.

Wondering

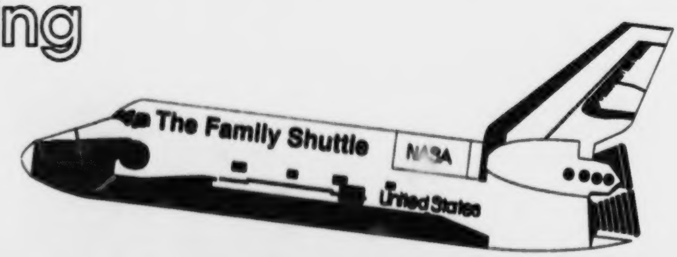
Not all questions have easy answers. Some questions do not have an answer yet. Children need to realize that not knowing an answer is part of curiosity and creativity. They need to know that it is all right not to know all the answers. Children, as well as adults, have to learn to become comfortable with this fact—with this natural ambiguity of life.

Despite one not knowing the absolutely right answer, children must be encouraged to continue to ask questions and think about their world. Adults should be encouraged to respond to children's questions. This interchange between adults and children enables children to develop thinking skills and to explore their ideas further.

Not to be overlooked during periods of wonder and creativity is children's need for privacy as they explore their own thoughts and ideas. Allow them some private time to accomplish this.

NOTES

Wondering



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ACTIVITY

Your child is being introduced to the sky and things that are in it. Your child's classmates are encouraged to recognize things that are in the sky and to use their imaginations sometimes and pretend what it would be like if they were really in the sky. As with all activities, you can reinforce things that are done in the classroom when the entire family helps with these important home activities.

Imaginary concept of a voyage to the Moon by an American illustrator, G. Dore, in the late 19th Century. (NASA Photo)

Wondering

1. During the day, take the family for a walk and talk about what is in the sky. Ask younger children to name things, such as clouds and the Sun, (Remind the children not to look directly at the Sun because it can damage their eyes). Talk about colors of objects in the sky. Tell younger members of your family what you thought about when you looked up at the sky and daydreamed when you were a child. Ask them what they think about.

2. As you walk, call attention to birds, moths or airplanes as they fly overhead. Ask younger family members how they believe these things got up there. Ask children if they would like to be in the sky. Discuss what they think it would feel like to be in the sky. What do they think Earth looks like from the sky?

3. Take your family for a walk during the evening. Repeat similar questions listed in numbers one and two.

MATERIALS AND RESOURCES

1. Paper and pencil.
2. Books that deal with the sky and outer space. The classroom teacher has a list that came with "Living In Space" curriculum.

An Orbiter is removed from its carrier (747) at the Mate-Demate Facility at Edwards Air Force Base (NASA Photo)

Rescue Ball For In-Space Rescue (NASA Photo)

Want To Give Your Children More Space To Grow?

Keep a list with your younger children of things they see in the sky as they walk and play outside or while they watch television shows. Let your preschooler take the list to school and share with classmates.

The Moon

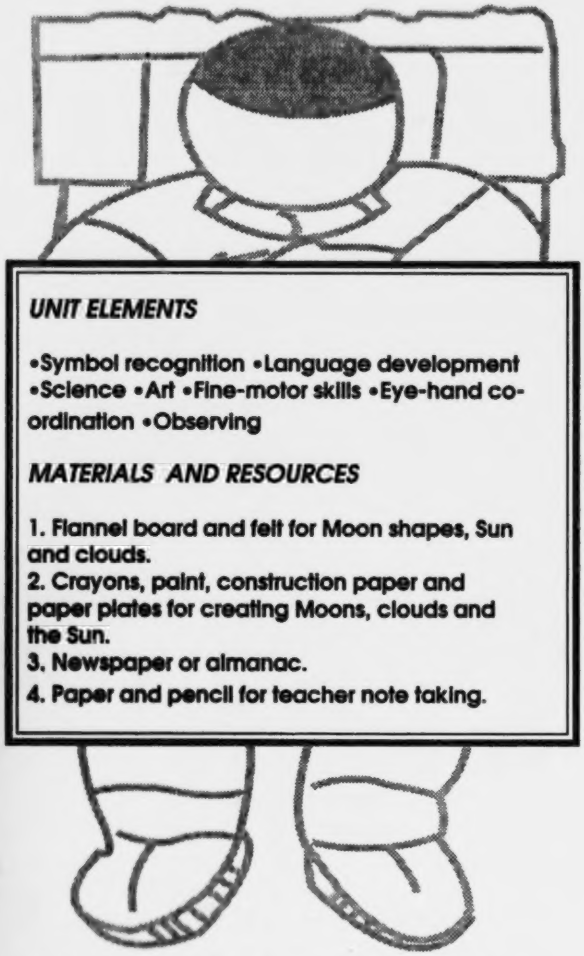
DESCRIPTION

This activity asks children to look up to the sky and recognize the Moon as a constant neighbor to Earth. Children are encouraged to notice that the visible part of the Moon appears to change shapes regularly during a certain period of time. Opportunities should be made throughout the year to reinforce the difficult concepts of shapes and distance.

ACTIVITY

1. Read a storybook to children about the Moon from the choices contained in the Resource Bibliography.

Artist rendition of gathering lunar soil (NASA Photo)



UNIT ELEMENTS

•Symbol recognition •Language development •Science •Art •Fine-motor skills •Eye-hand co-ordination •Observing

MATERIALS AND RESOURCES

1. Flannel board and felt for Moon shapes, Sun and clouds.
2. Crayons, paint, construction paper and paper plates for creating Moons, clouds and the Sun.
3. Newspaper or almanac.
4. Paper and pencil for teacher note taking.

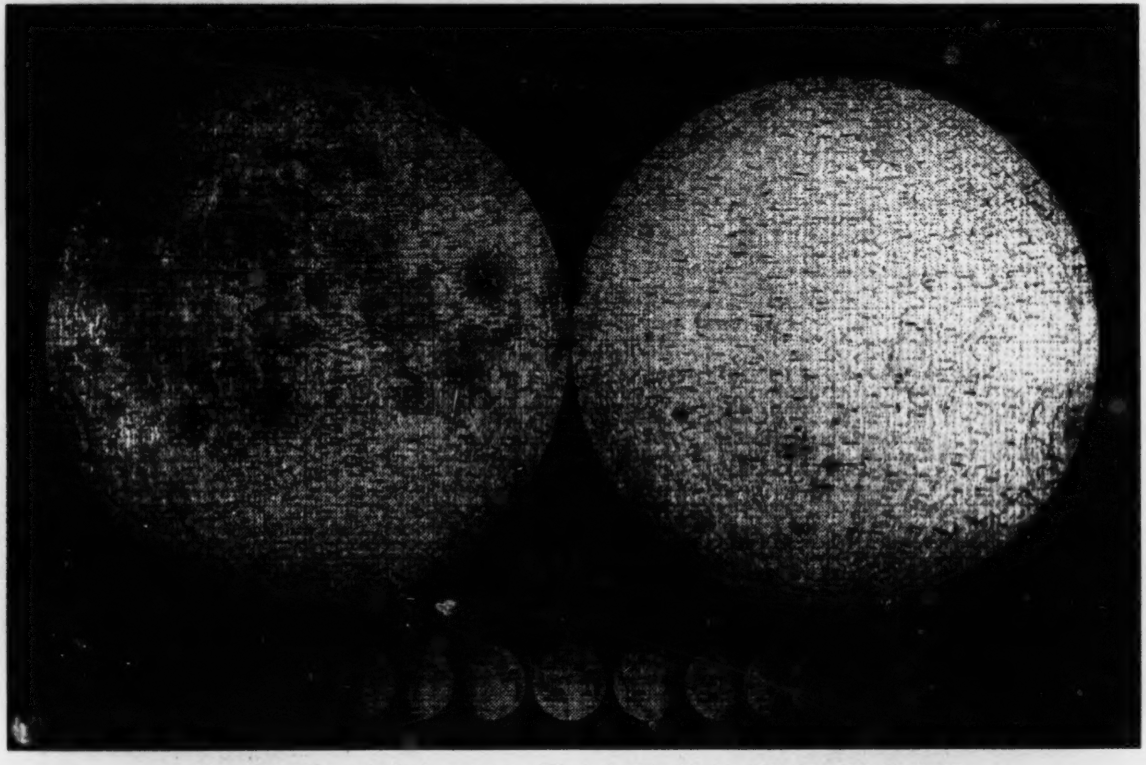
2. On a day when the Moon is visible during the daytime, take a small group of children outside to look up at it. Talk about the storybook which was read to the children and ask them for their ideas about the Moon. Talk about the size of the Moon, its shape and how far away it seems to be.

3. Begin to keep notes on children's comments, ideas and questions as they learn about the Moon. Toward the end of their time exploring the Moon, talk about their ideas with them and let them create a story about the Moon.

4. Use a flannel board and ask children to identify the shape that most resembles the Moon's shape they observed. Ask children to recall what they saw in the sky besides the Moon. Help them place a Sun and some clouds if that is appropriate. Let children play with this sky board as one activity for the day.

5. Encourage children to draw pictures of what they saw outside by supplying crayons, paint and paper. Discuss the artwork with children if they wish and display in the classroom at their eye level.

6. On a second day, help children recall what they learned about the Moon. Ask them specifically about the shape of the Moon.



Map of the Moon, including phases (Photo by The National Geographic Society)

7. Show children other Moon shapes by placing them on the flannel board. Name the shapes as you place them on the board: Crescent, Quarter, Gibbous and Full.

Quarter refers to the first quarter or last quarter of the illuminated Moon.

Crescent is the shape of the Moon when less than half (but more than a quarter) of the Moon is illuminated.

Gibbous describes the Moon when more than half, but less than the Full Moon is illuminated.

Full is the term used when the complete side of the Moon facing Earth is illuminated.

8. Let children place the various Moon shapes on the flannel board and help them say the words. Ask children if they can find more of these Moon shapes anywhere in the classroom.

9. Give children the opportunity to cut out the various Moon shapes by providing them with safety scissors and white or yellow construction paper or sturdy paper plates. Ask the children to identify the shapes they cut out.

The Moon

10. Ask children to look at the Moon at night during the next few weeks with their family and cut shapes out and bring them to class to share.

11. Have children help you locate information in the newspaper about Moon shapes and its rising and setting times.

12. Use the flannel board, a classroom window or a bulletin board to display various Moon shapes as they appear in the sky throughout a month.

13. Make night scenes on black paper. Let children use white and yellow chalk while reinforcing vocabulary associated with the shapes of the Moon.

14. Read stories about the Moon (See Resource Bibliography).

15. Encourage children to tell stories about the Moon while you record them.

16. Locate and sing songs about the Moon.

17. Provide clay and let children create various Moon shapes.

18. Look at the Moon with a telescope, if it is possible.

BACKGROUD NOTES

Even though it is approximately 240,000 miles away, the Moon is our closest neighbor in outer space. It is neither a star nor a planet, but a hard rock satellite of Earth. Formed between 4 and 4.6 billion years ago, our Moon completes an orbit around Earth approximately every 29 days. Giant and tiny meteors crashed into the Moon's surface billions of years ago and are responsible for the craters which cause us to see shadows when we look at the Moon. Because there is no air, no water and no environment like we know on Earth, the footprints which the 12 Apollo astronauts left when they walked on the Moon will remain for centuries.

The Moon has no light of its own. The light we see is the Sun reflecting off the Moon's surface. The Sun has the same effect on the orbiting Moon as it does on the Earth, lighting one half of the globe while the other half is dark. The 24-hour spin of the Earth gives us day and night. When we see a "Full Moon," we are viewing the whole lighted side of the Moon. When we see a "Crescent Moon," we are observing a smaller portion of its lighted side.

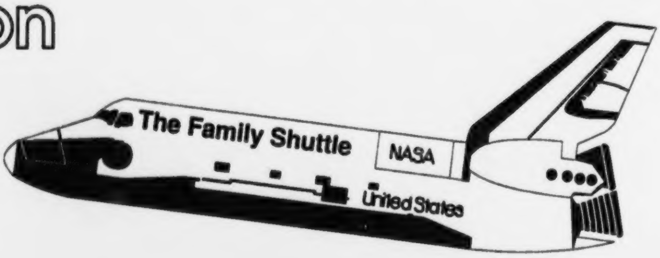
The sunlit side of the Moon is approximately 250 degrees above zero (Fahrenheit), while the darkened part of the Moon is very cold, about 250 degrees below zero (Fahrenheit). Lunar landings by Apollo crews took these temperature variations into account by designing spacesuits with both cooling units and heat-retaining insulation materials.

Artwork by Pinellas County, Florida preschool students showing cutouts of the Moon in its various phases.

The Moon

NOTES

The Moon



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ACTIVITY

Children are learning about the Moon at preschool. These activities reinforce what they already know about the various shapes of the Moon during its monthly orbit around Earth. Also, it is hard for children of this age to gauge distance. Help them by frequently discussing the distances of things that you and they look at daily. Talk about "near," "far," "close-by" and "next-to."

Children are learning the following terms to describe the various phases of the Moon:

Quarter Moon refers to the first quarter or last quarter of the illuminated Moon.
Crescent Moon is the Moon's shape when less than half (but more than a quarter) of the Moon is illuminated.
Gibbous describes the Moon when more than half, but less than the Full Moon is illuminated.
Full is the term used when the complete side of the Moon facing Earth is illuminated.

1. Observe the Moon during the day or early evening by taking your family outside or looking at it from a window.

A portion of a map of the Moon, including phases (Photo by The National Geographic Society)

The Moon

2. Talk about the shape of the Moon. Tell them the only reason we can see the Moon is because the Sun is reflecting off its surface.

3. Discuss how big the Moon must be and how far away it must be. Talk about the 12 astronauts who walked on the Moon. Tell your children there is no air to breathe or water to drink and therefore no one can live there like we do on Earth. Ask them if they know any Moon stories and help them distinguish between what is real and what is made-up.

4. If clouds cross in front of the Moon, talk about the clouds being closer to us than the Moon is.

5. Tell your family members what you used to think about when you looked at the Moon as a child.

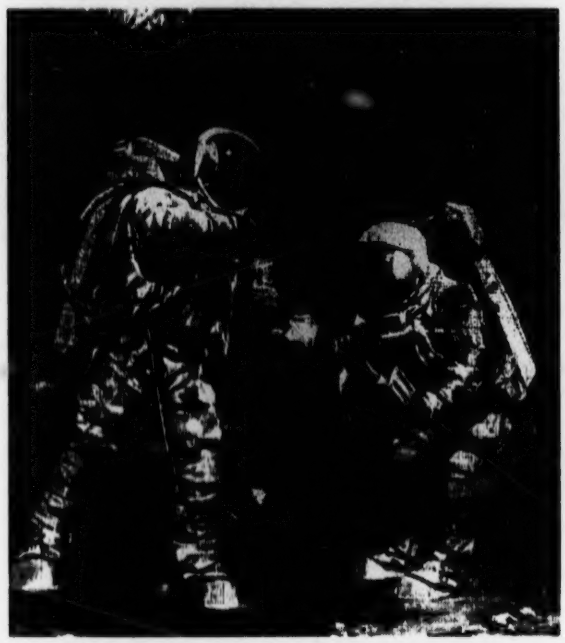
6. Ask the teacher for storybook suggestions. Read at least one to your children.

7. You may want to make one window in your home a special "wonder window" for your children where they may go from time-to-time to observe the sky and think by themselves.

8. Establish a certain time when you and your family take walks and discuss various things that you see in the sky.

MATERIALS AND RESOURCES

1. Dark paper and crayons for artwork.
2. Books from the Resource Bibliography.



Artist rendition of gathering lunar soil (NASA Photo)

Want To Give Your Children More Space To Grow?

1. Sing songs that you know about the Moon. Ask your children's teachers for song suggestions.

2. With the help of your children, locate the daily report of the Moon's phases and rising and setting times in the newspaper.

3. Encourage your children to draw the Moon on dark paper. Children may want to add some stars and clouds. Discuss the pictures with children if they wish and write down the children's stories about the pictures. Attach the stories to the pictures and read them back to the children. Hang them near a window from which the children may observe the Moon.

The Stars

DESCRIPTION

This activity helps children focus on stars in the sky. Children will begin to think about stars being present all the time, but our ability to see them only occurs when it is dark outside. Since there are an infinite number of stars in our galaxy, this presents an opportunity to talk about quantities and the largest numbers the children know. It also provides an especially appealing opportunity to involve additional parent and community resources in a classroom activity by taking the children on a field trip to a nearby planetarium, or planning an evening get-together for observing through a telescope.

Local school district science curriculum supervisors, librarians, local college professors and amateur astronomers may be valuable allies in this effort. Parents will enjoy the field trip, learn along with their children and help manage the group.

ACTIVITY

1. Take children outside and have them recall what is in the sky. Tell them that there are other things in the sky that they cannot see right now. They are called stars. Stars are bright, fiery balls in the sky. There are so many stars that we cannot count all of them. The Sun is a very bright and big star. It is the only one we can see during the day.

2. Ask children if they have ever heard of stars and what do they know about stars. Talk about the shape of stars. Show them a real star and a five-pointed star and ask children to note the differences. Real stars do not look like five-pointed stars but people have been drawing them and thinking about them this way for hundreds of years. Tell them that stars have always meant something special to people because they are high in the sky, bright, and pretty.

UNIT ELEMENTS

• Memory • Language development • Eye-hand coordination • Problem solving • Observing • Symbol recognition • Music • Experimenting

• Fine motor skills

MATERIALS AND RESOURCES

1. Picture of a real star and a five-pointed star.
2. Story about stars from the Resource Bibliography.
3. A flashlight or small candle.
4. Aluminum foil, staples, glue or tape, black flannel board or construction paper.
5. Construction paper or paper plates, scissors, paper towel tube and crayons.
6. Black construction paper and aluminum foil.

3. Ask children to look at the sky tonight if there are no clouds and share what they see the next day.

4. Take children back to the classroom and read a storybook about space from the Resource Bibliography. Talk about the story.

5. Sing "Twinkle, Twinkle, Little Star" and perhaps other star-themed songs with the children.

The Stars

6. Demonstrate the impact daylight has on our ability to see stars. Light a small candle or turn on a small flashlight at the farthest end of a well-lighted classroom. Have children observe its minimal brightness. Repeat the activity after darkening the classroom. Children should be able to see an increased intensity of the flame or flashlight beam. Talk about the experiment and the reason we see stars at night.

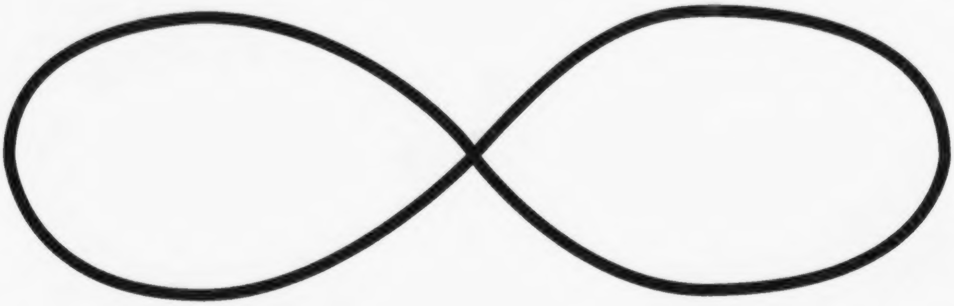
7. On a second day, ask children to share what they saw the night before when they looked at the clear sky. List their responses on paper and discuss them with the children.

8. Have children make stars by crumpling pieces of aluminum foil and staple, glue or tape them to black flannel board or construction paper. Children may want to add clouds and a Moon to their sky. Count how many stars are on the board. Ask children to think of the largest number they can imagine and tell them there still would be more stars than that in the sky. This concept is "infinity" and means that we never get to the end of the counting process.

9. Have children cut out stars of their own design from construction paper or paper plates. Encourage children to color them with crayons. Just as scientists who discover a new star get to name it, have children name their new star and print the name on the back of their stars. Discuss why children chose the names they did for their stars. Allow children to take their stars home to their parents, or collect them and make a star mobile for the classroom.

10. Make a toy telescope from a paper towel tube. Have children paint it and peer through it at the stars to play astronomer (a scientist who studies stars).

11. Give children a small piece of black construction paper and have them make "stars" by punching small holes throughout the paper. As the children complete this activity, glue or staple a similarly sized piece of aluminum foil behind the construction paper to simulate a night sky of stars, or shine a flashlight through it.



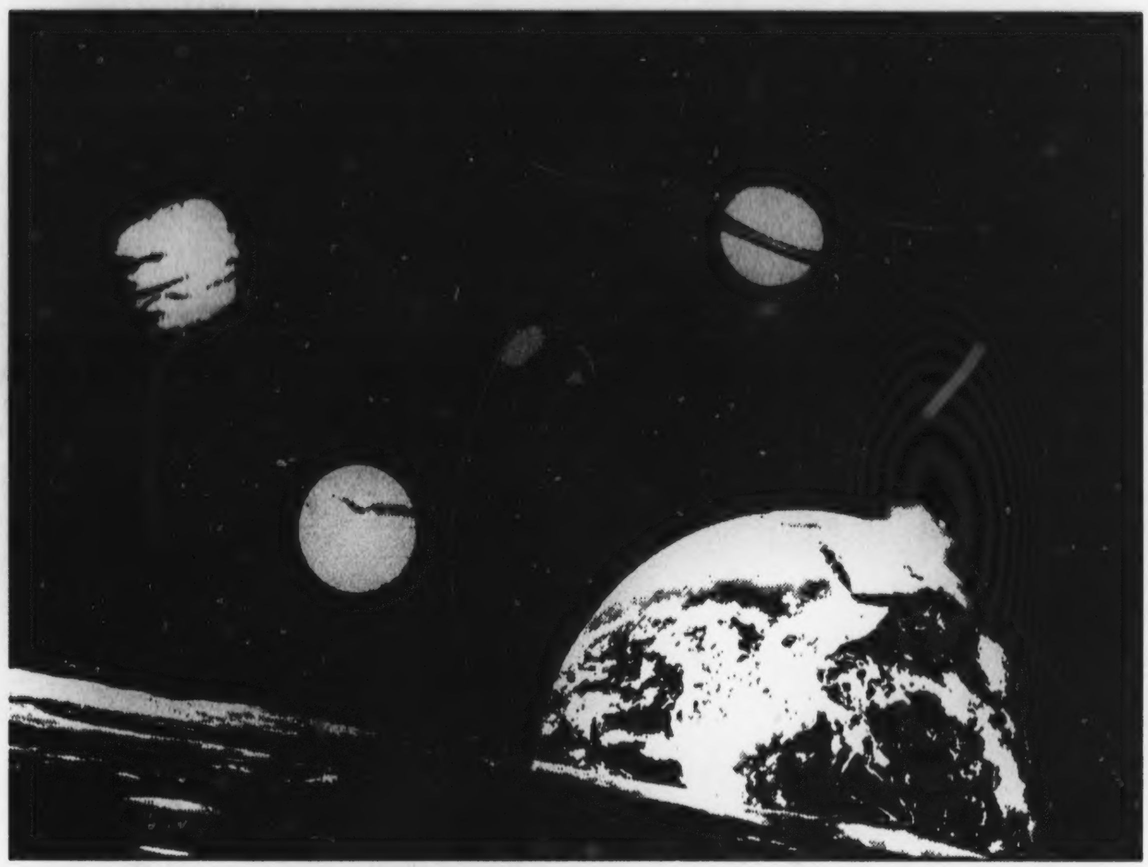
The symbol for infinity.

The Stars

BACKGROUND NOTES

We live in a galaxy of over 100 billion stars, and there are millions of other galaxies besides our own. On the clearest night, we only can see 2,500 stars with the naked eye. During the day, which is when our part of the Earth is facing the Sun, the Sun's brightness overpowers all the weaker, more distant stars.

At night, when we are on the other side of the Earth from the Sun, the darkness allows us to see the stars. The stars are there all the time—we just can't see them during the day.

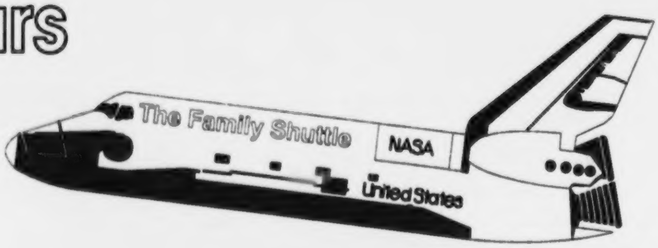


Representation of the solar system, including many possible targets for manned exploration in the future. (NASA Photo)

The Stars

NOTES

The Stars



BACKGROUND NOTES

We live in a galaxy of over 100 billion stars, and there are millions of other galaxies besides our own. On the clearest night, we can only see about 2,500 stars with the naked eye. During the day, which is when our part of the Earth is facing the Sun, the Sun's brightness overpowers all the weaker, more distant stars. At night, when we are on the other side of the Earth from the Sun, the darkness allows us to see the stars. The stars are there all the time—we just can't see them during the day.

ACTIVITY

Your preschool child is discovering that stars are present in the sky all the time, but we can see

Representation of the solar system, including many possible targets for manned exploration in the future. (NASA Photo)

The Stars

them only at night. Parents play a crucial role in helping children understand this. You and your children can go outside during the evening, gaze at the stars and talk about them. This provides the best way for preschoolers to learn about stars. Children this age understand things more fully when they see examples of what is being discussed and when they have the chance to experiment with them.

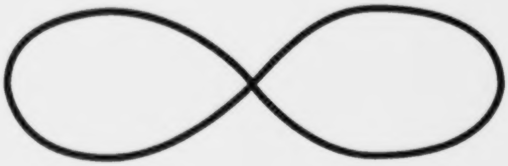
Talk about the evening sky with children while they are looking at it. A visit to a local planetarium and/or an evening sky walk with a local expert organized by parents (with the help of the classroom teacher) are ideal ways for parents to learn more about stars. These are fascinating field trips for children if done in a developmentally appropriate way for preschoolers.

1. Take your children outdoors on a clear night. If it is a warm evening, spread a blanket on the ground. Look at the stars together.

2. Ask your children what they know about the stars and talk about it.

3. Call attention to the fact that some stars are very bright, while others are very faint specks in the sky.

4. Tell children that stars are present in the sky all the time, but we can see them only when the sky is dark and when there are no clouds hiding them. Ask them to think about positions. Ask which is "higher" and which is "lower"—floors or ceilings, basements or roofs, grass or trees, and clouds or stars. Help your children think of other examples outside and inside your home.



The symbol for infinity

5.Tell children the Sun is our nearest star but it is only one of billions in our galaxy. This may be a good time to talk about numbers with your children. Maybe they want to point and count stars. Tell children that the largest number we know is called "infinity" and that it means "more than we can count" and has no ending.

MATERIALS NEEDED

Blanket.

Want To Give Your Children More Space To Grow?

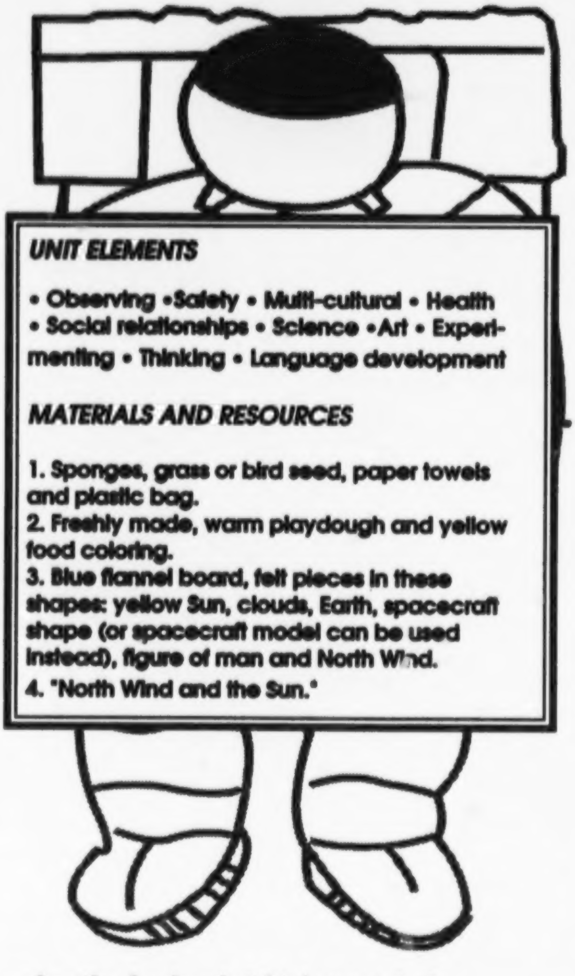
1. Ask some other parents to help you organize a visit to the local planetarium so you can learn more about the stars.

2. Have an evening sky walk for the families with a local astronomer.

3. Ask the teacher to help you plan either one of these activities.

4. Ask the teacher for a book or two to read your children.

The Sun



UNIT ELEMENTS

• Observing •Safety • Multi-cultural • Health • Social relationships • Science •Art • Experimenting • Thinking • Language development

MATERIALS AND RESOURCES

1. Sponges, grass or bird seed, paper towels and plastic bag.
2. Freshly made, warm playdough and yellow food coloring.
3. Blue flannel board, felt pieces in these shapes: yellow Sun, clouds, Earth, spacecraft shape (or spacecraft model can be used instead), figure of man and North Wind.
4. "North Wind and the Sun."

DESCRIPTION

To help children realize the Sun provides energy and growth to most living things is very difficult because the process of growth is slow and happens in small increments. Children will more easily understand the Sun as a provider of heat and light, however, because they can witness the Sun's effects on objects and themselves.

These activities will take a number of days to complete. Throughout the year, opportunities should be provided by the teacher to reinforce and expand upon the concepts discussed in this unit, as well as others.

Since this activity focuses on the Sun, children will be tempted to look at it directly. Caution children against this and reiterate this safety fact throughout the activities. Having children's sunglasses donated for classroom use by a local store may be a good way to introduce the power of the Sun and our need to protect our eyes against its effects.

ACTIVITY

1. Begin on a sunny day. Ask children if they know what the Sun is. Talk about whatever other information they may know. Tell the children that the Sun is a star. It is the brightest star we have. Ask if they can see sunshine out the window.

2. Try to convey that the Sun makes it light outside, otherwise it would be dark on Earth. Ask children if they know where the Sun is when it is dark outside. Tell them that the Earth is so large that the Sun can only shine on part of it at a time. Tell them that children in China are in the dark right now because the Sun is shining here and not there. Children in the Soviet Union are asleep right now also, but have daytime activities when we have night.

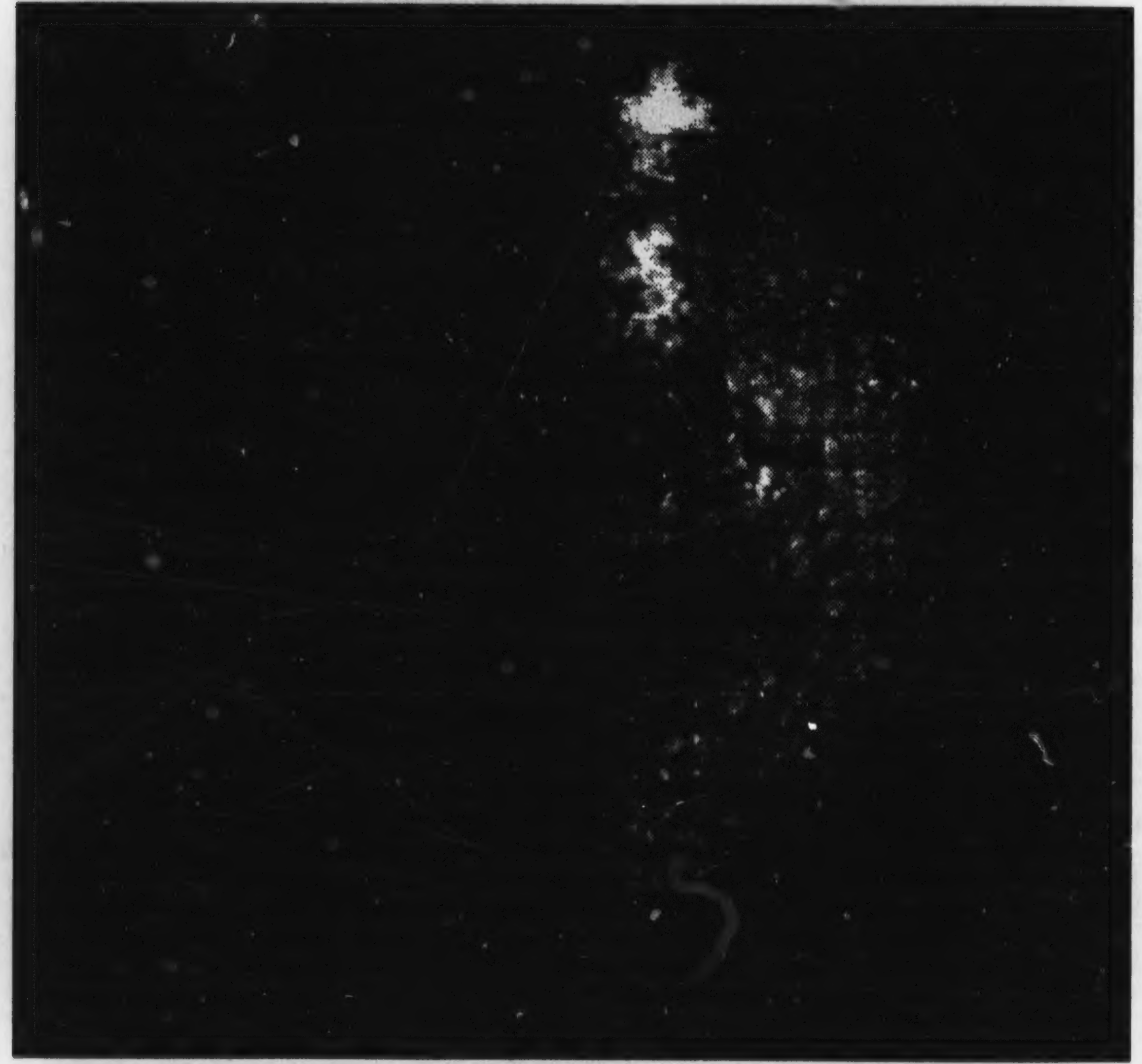
3. Tell the children that clouds are nearer than the Sun and may hide the Sun from us. This makes the day less bright, but not dark.

4. Tell the children that the Sun does more than make our daylight. It helps things grow. Let children sprout some fast-growing seeds (such as grass seed or "bird seed" sold for pet canaries) on wet sponges. Place half the sponges in a closet or away from sunlight; put half on a window sill or bright spot in classroom. Keep them all damp. During the next few days, have children observe the different growth patterns and let them talk about the difference that the Sun made on the sprouts.

The Sun

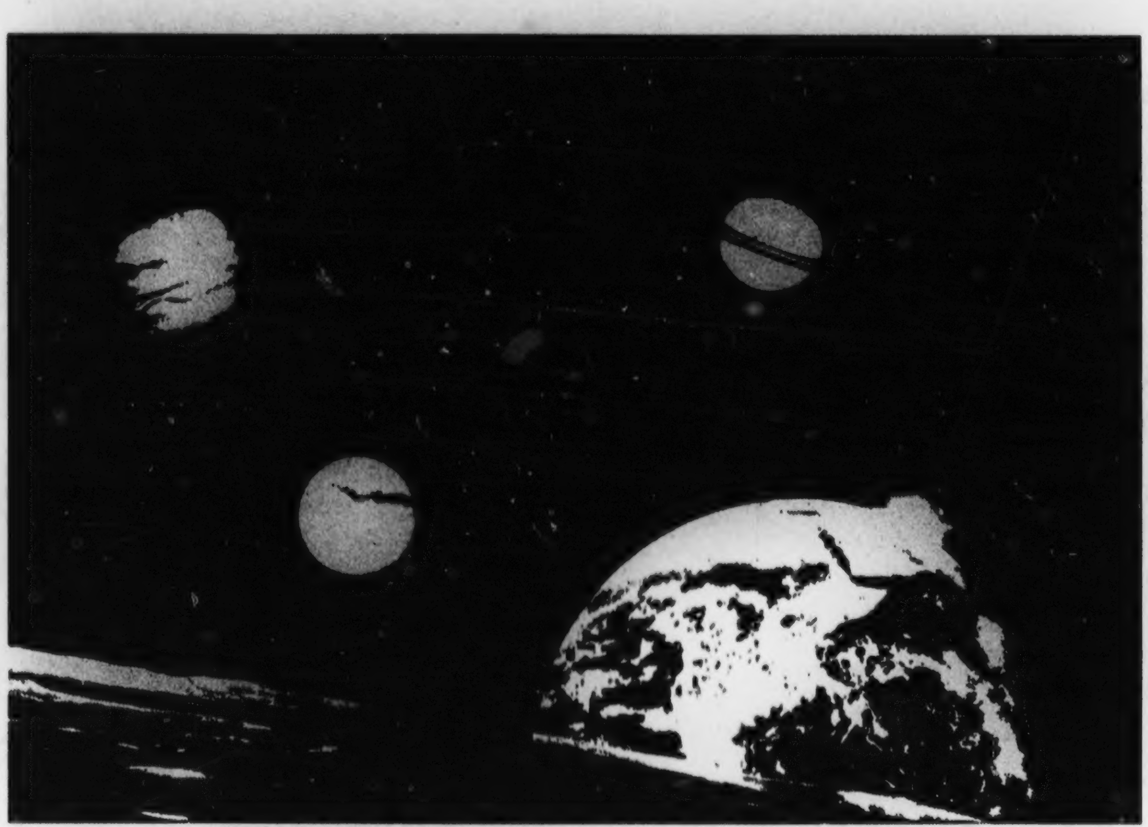
5. Let the children experience the light and warmth of the Sun by taking them outside on a sunny day. Let children feel things that have absorbed the Sun's heat: cars, sidewalks, sand, benches and playground toys. Discuss what made these things warm. If it is cool yet sunny, have the children stand in the shade and in the Sun at different times and let them compare feelings of warmth in both places. They can also compare the feel of toys and equipment in shade or sunlight.

6. Let children experience the power of the Sun's heat by having them soak paper towels in water and observing half of the towels drying in the sun and half in a shaded area. Help children hang the wet towels on a clothesline in the bright Sun, just as a parent may do with clothes.



The Sun (NASA Photo)

The Sun



A composite photograph of many elements of our solar system (NASA Photo)

Wrap the other half of the towels in a plastic bag and put in a closet. Ask the children periodically to observe the drying process and at the conclusion discuss what made the sun-drenched towels dry faster.

7. Perhaps while the wet towels are drying, show the children a bright yellow Sun on a blue flannel board. Add some clouds if the day is cloudy or if children ask for them.

8. Using the flannel board again, place Earth and the Sun on it. Have a spacecraft model or cut a shape of one from felt and slowly move it from the Earth toward the Sun. Ask the children if this is a good idea. Ask if they think exploring the Sun by astronauts is a good idea. Tell children that spacecraft will not go close to the Sun because it gets to be too hot and will burn the spacecraft. Reinforce the idea that the Sun's heat may be very harmful to our bodies, especially our eyes.

9. Allow children to use the flannel board during free play if they choose.

10. Read "North Wind and the Sun". Talk with the children about what types of clothing to wear when the wind blows and when the Sun is out. Explain to them how the wind can make it feel cold even when the Sun is shining bright.

11. Give children freshly made, warm play dough with yellow food coloring squirted into it (or help them make it) and let them experiment with it. Ask children to talk about using play dough.

The Sun

BACKGROUND NOTES

Our Sun is a star very much like the billions of other stars in the sky. A star is like a giant hydrogen bomb held together by gravity. The Sun is so large that one million Earths could fit inside.

The Sun provides the light and heat for the surface of the Earth from 93 million miles away.

NOTES

Plants use this energy to grow. Animals, in turn, feed off the plants and other animals ensuring a continuous life cycle. The Sun warms the planet to temperatures that life on Earth needs. Variations by a few degrees upward could send glaciers sliding.

The Sun's radiation is so powerful it could hurt us. Thankfully, the Earth's atmosphere blocks most of the harmful solar rays. Still, we cannot look directly at the Sun or stand to be out in it for too long.

The Sun

The Family Shuttle
NASA
United States

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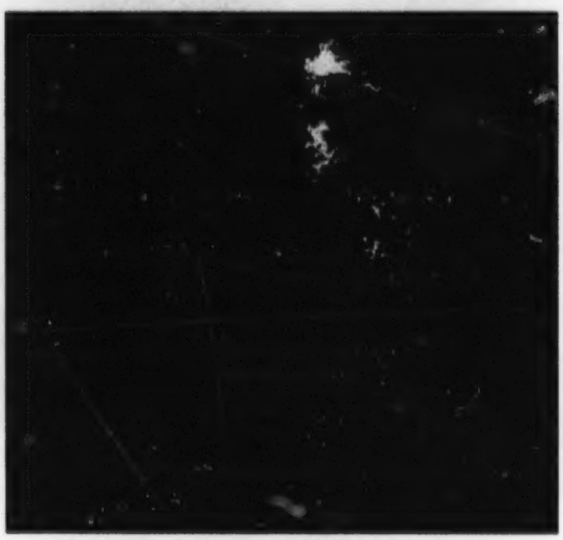
ACTIVITY

Your child is learning a number of things about the Sun: it is in the sky, it is a star, it supplies Earth with light and warmth, and it helps living things grow. You may expand upon these ideas at home and provide some opportunities which children cannot experience at most preschools. You should reinforce the idea that the Sun is very powerful and that it is dangerous to look directly into the Sun.

1. Try to observe a sunrise and sunset with your family. Your children will enjoy watching darkness turn to dawn, and daylight turn to twilight. (Newspapers usually list the times of sunrise and sunset.)



The Sun (NASA Photo)

2. Talk about colors and shades of color caused by the sunset or sunrise. Ask your children where they think the Sun is going. This activity also provides a chance to talk about the Earth being so big that it is daylight somewhere else while it is nighttime where you live and vice versa. Maybe your family has relatives or friends who live in another part of the world that would demonstrate that not all people have daylight or nighttime at the same time. Children may be able to remember that days are long in the summer and shorter in the winter, too.

4. Sing a song or read a storybook with your children about the Sun. This may be a good bedtime activity. The teacher may have some suggestions about songs or books.

The Sun

5. Make a "Sunrise Salad" with your children. This activity gives you the chance to talk about a number of things while creating a pretend sunrise.

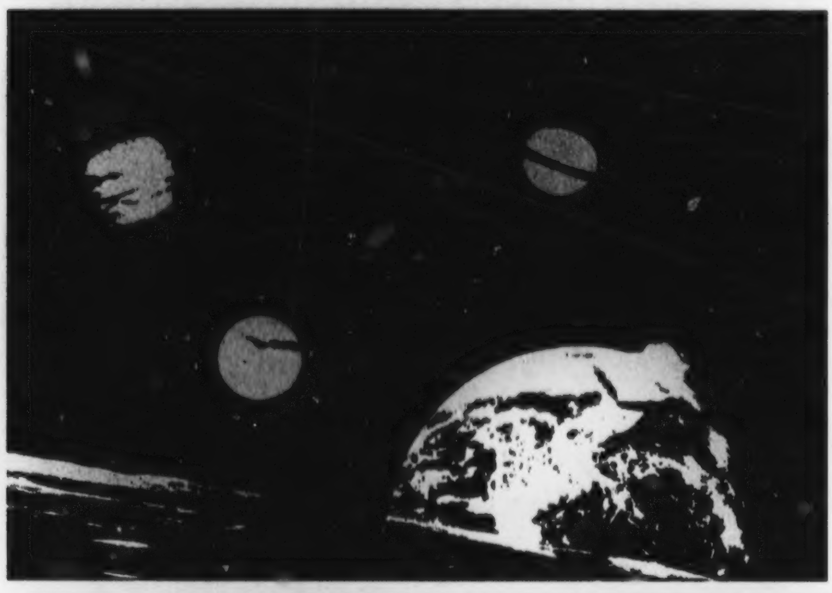
Drain juice from pineapple, keeping slices in can. Let children observe as you add 1 c. boiling water to gelatin in a small bowl. As you and the children stir, talk about gelatin dissolving in water. Pour liquid gelatin into can, place in refrigerator six to eight hours or overnight. Ask children to predict what will happen. When gelatin is set and ready, remove from the can.

Talk about liquid changing to solid with cold temperature and time. Slice between pineapple rings, then slice each ring in half. Let children make sunrises by using cheese strips as Sun's rays with each 1/2 ring. Makes enough for the entire family.

MATERIALS REQUIRED

Sunrise Salad:
8 oz. can of sliced pineapple
1 c. of water
2 oz. pkg. lemon gelatin
8 oz. cheddar cheese cut in 1/2" x 1/4" strips.

Sunrise salad recipe contributed by Gadsden County Head Start, Quincy, FL.



A composite photograph of many elements of our solar system (NASA Photo)

Want To Give Your Children More Space To Grow?

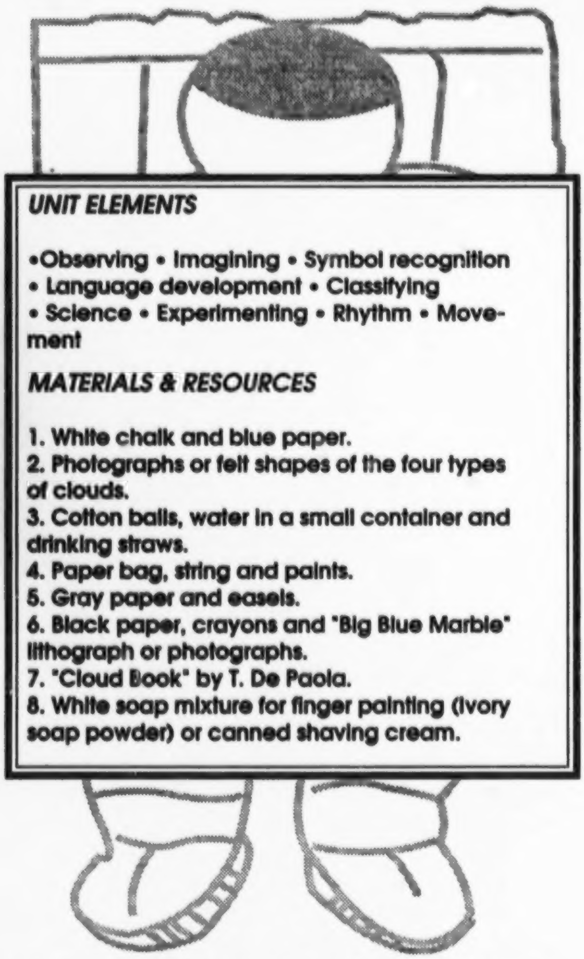
If it is warm, sunny weather, have your children feel things that have absorbed heat from the Sun, such as a car, sidewalks, park benches or any item that has been in the Sun. Discuss what made these things warm. If it is cool, yet sunny, have the children stand in the shade and then in the Sun. Ask them to compare the difference between the feeling of heat in the shade and heat in the Sun. Talk about why this is so.

The Clouds

DESCRIPTION

This set of activities asks children to identify and investigate clouds. Activities discuss various types of clouds and introduce clouds as containers of rain. Cloud movement provides a chance to talk about wind and some of its effects.

Astronaut McCandless travels free from the shuttle, high above the clouds of the Earth. (NASA Photo)



UNIT ELEMENTS

•Observing • Imagining • Symbol recognition • Language development • Classifying • Science • Experimenting • Rhythm • Movement

MATERIALS & RESOURCES

1. White chalk and blue paper.
2. Photographs or felt shapes of the four types of clouds.
3. Cotton balls, water in a small container and drinking straws.
4. Paper bag, string and paints.
5. Gray paper and easels.
6. Black paper, crayons and "Big Blue Marble" lithograph or photographs.
7. "Cloud Book" by T. De Paola.
8. White soap mixture for finger painting (Ivory soap powder) or canned shaving cream.

ACTIVITY

1. On a day when clouds are in the sky, take a group of children outside to look at the sky. Take white chalk and blue paper with you for a later activity. Focus children's attention on clouds and talk with them about the various shapes, sizes, coloration and movement which they see. Ask them what they think clouds are. Accept and discuss their comments.

2. Ask children to pick one cloud and watch it for a few minutes. Ask them to judge if it moves in the sky or if its shape changes. Discuss what they observe. Ask children if any of the clouds reminded them of an animal, or looked like a tree or any of their toys or anything they have seen in a movie or on television.

3. Ask children if the clouds are closer or farther than the Sun. Ask which is closer to Earth and the ground: the clouds or the Sun. Which one is further away from us on Earth? Choose position words and prepositions which are appropriate for discussion.

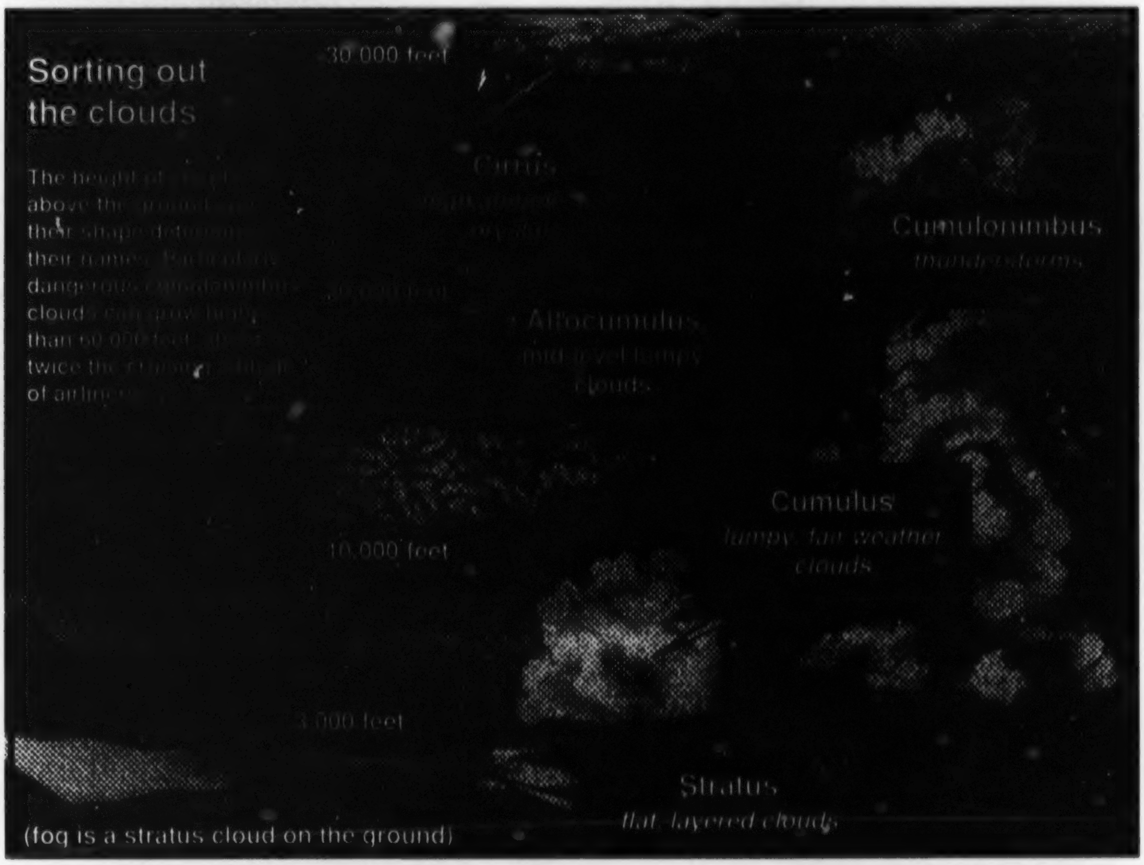
4. Ask children if they want to draw clouds by providing them with white chalk and blue paper. Talk about their artwork when they have finished.

The Clouds

5. Back in the classroom use photographs or a flannel board to show various shapes and four types of clouds. The four cloud types are:

cirrus, a stretching, wispy, white cloud
cumulus, a billowy cloud
nimbus, a gray rain cloud extending over the entire sky
stratus, a stretching, low layer of clouds

Ask children to identify any of these shapes which they observed outdoors.


Sorting out the clouds
30,000 feet
Cirrus
20,000 feet
Altocumulus
mid-level lumpy clouds
Cumulonimbus
thunderstorms
Cumulus
lumpy, fair weather clouds
10,000 feet
3,000 feet
Stratus
flat, layered clouds
(fog is a stratus cloud on the ground)

A study of cloud types which are seen every day all around the country. (By Elys McLean-Ibrahim, USA Today Graphic)

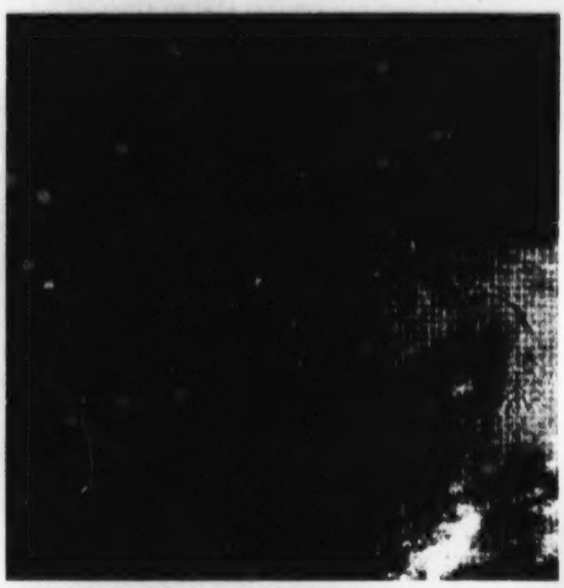
6. Ask children if they think clouds stay in one place forever. Suggest that they move all over the neighborhood and may move to the sky over the far end of your town. They may float to the next city and even across your state. Some may even float the whole way around the Earth. Tell children that the wind high above them blows the clouds in the sky.

7. Let children duplicate floating clouds by providing them with cotton balls on a table and have them blow the cotton across the table. To dramatize rain clouds and their slower motion in the atmosphere, you may want to dip a few cotton balls in water, squeeze out excess water and let the children experiment with the difference between blowing dry and wet "clouds." You may want to provide them with individual

The Clouds

drinking straws to facilitate the activity. Encourage, accept and talk about their observations.

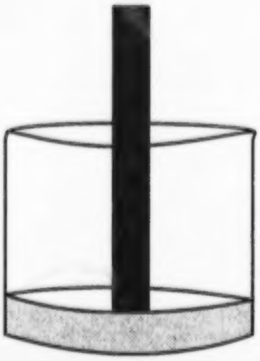
8. On a day when there is some wind outside, take a group of children outdoors and give each a paper bag with the end tied. Let them see how the wind blows their "clouds" along the ground. Children may crayon or paint the bag with clouds on the outside before the experiment. Talk about what made the "clouds" move and use this activity to reinforce the necessity of keeping Earth clean and neat by making sure children pick up their "cloud bags."



Photograph from space of hurricane Elens in October of 1985, showing the swirl of clouds. (NASA Photo)

9. On an overcast day, take children outdoors and ask them to predict what may happen with the weather. Ask children to compare this sky with a sky they remember when it was sunny. Talk about the differences they see. Talk about overcast days as being one, big cloud. Explain how rain comes from these clouds. Tell the children that people (meteorologists) predict or guess, based on facts, what the weather will be like. People may change some of their daily schedule based on what the weather will be like. Ask children for their examples and discuss how important weather is to us. You might give an example of wearing rain boots on a rainy day, or not going to the beach because it is going to rain.

A view from above the shuttle Columbia, showing heavy cloud cover below. (NASA Photo)



A can with a ruler may be used to measure rainfall. (YAC Illustration)

Shuttle climbing through high clouds on its way to orbit (NASA Photo)

10. On a day when it rains, take appropriately dressed children outdoors. Encourage them to look up into the rain if at all possible. (People generally avoid looking into the rain.) It is valuable for children to realize that rain originates from above them as opposed to being blown sideways from somewhere or being splashed up from the ground. Ask children to observe if the sky becomes brighter after a rain. Ask them for their opinions about why it has happened.

11. Provide paints, gray paper and easels on days you talk about rain and let children experiment on their own. Talk about their artwork if they choose.

12. Extend the vocabulary of the children by labeling different types of clouds. Tomie De Paola's "Cloud Book" provides this information.

Be sure to show pictures or observe types of clouds outdoors as you label them accurately.

13. Show children the NASA study print called, "Big Blue Marble." Be careful not to confuse the children by calling the picture by its title, however. Call it a "picture of the Earth." Ask children what they see. Explain that if you could fly high above the clouds into space like the astronauts, you would see the clouds like this. Talk about what children think about clouds at this point. Ask them to pretend they are in outer space and draw what they see from their spacecraft. Provide children with black paper, crayons, paints or chalk and discuss their work when they have finished.

14. Let children be creative with cloud formation by finger painting with white soap mixture (2 c. Ivory soap powder, 1 1/4 c. water beaten together) or canned shaving cream on blue paper.

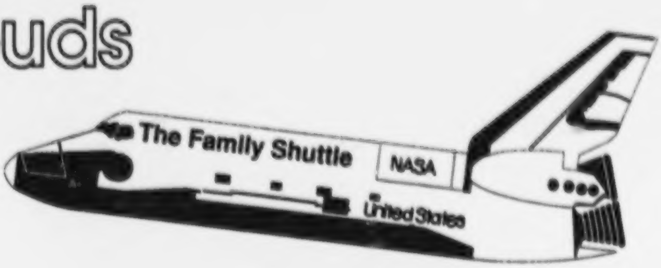
15. Encourage creative movement by the children with the song and finger play of "Eency, Weency Spider" and other songs and finger plays about rain.

BACKGROUND NOTES

In the air, clouds (mainly) form from the water that evaporates from the sea, but also from the streets, yards and playgrounds and even slices of apples. The water is like steam, not liquid. Then, when the clouds get cold enough, they turn back into water; that is, they condense and become falling rain or, if they are really cold, snow or hail. The "Big Blue Marble" picture shows how the clouds hug the Earth.

NOTES

The Clouds


The Family Shuttle
NASA
United States

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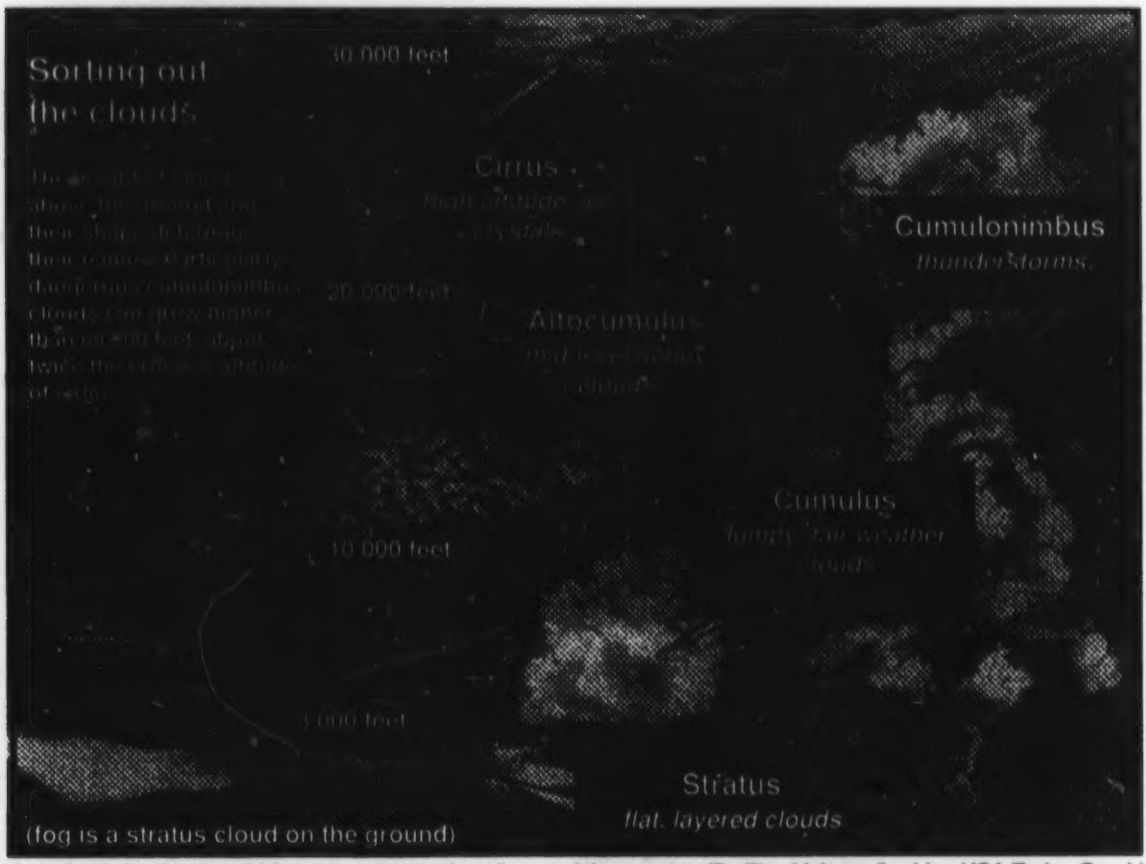
ACTIVITY

Your child has been learning about clouds at school. Outdoor activities by the family at home will help your children more fully understand different kinds of clouds, different weather and rain. As always, your attention to their curiosity helps your children continue their search for answers and permits them to build on knowledge they already have.


Sorting out the clouds
30,000 feet
Cirrus
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Stratus
flat, layered clouds
(fog is a stratus cloud on the ground)

A study of cloud types which are seen every day all around the country. (By Elys McLean-Ibrahim, USA Today Graphic)

The Clouds

1. Take time during the month to go for walks on different days and talk about different cloud sizes and different kinds of clouds and how they float in the sky because of the wind. Make up stories about clouds that look like shapes of something real. Write down these stories and read them to your children. Your children may like to draw pictures about the stories.

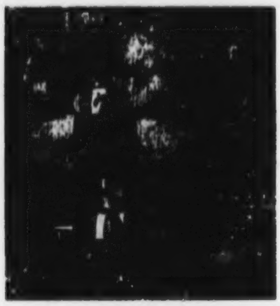
2. Take a walk on a day when the sky is overcast and talk about the possibility that it is going to rain. Discuss how this day is different from a sunny day. Ask your children what they know about rain and discuss it with them. Talk about things they do differently on a day when it rains.

3. On a windy day, go for a walk in a park area and take a paper bag. Put the open paper bag on the ground and let the children observe as the wind blows the bag around. Tell your children that this is the same way clouds are moved in the sky.

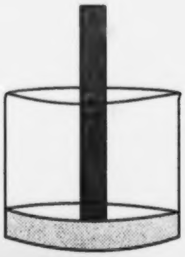
4. During a light rain, when there is no thunder or lightning present, go outside with your children, turn your faces to the sky and catch some rain in your mouth. Talk about rain coming from above the children and not from the side or even from the ground where it is when they usually see it.

MATERIALS NEEDED

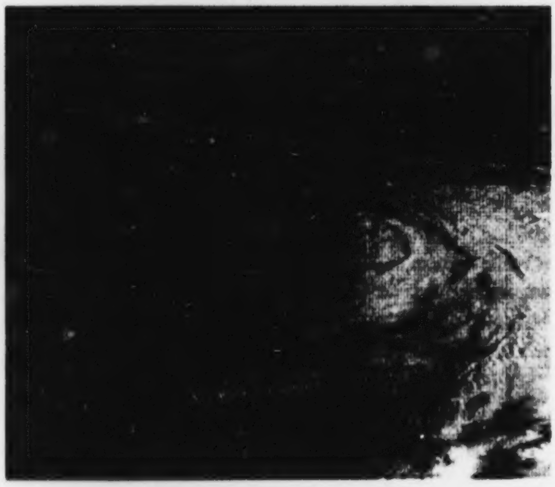
Paper bag, container to collect rain and a ruler.



A view from above the shuttle Columbia, showing heavy cloud cover below. (NASA Photo)



A can with a ruler may be used to measure rainfall. (YAC Illustration)



Photograph from space of hurricane Elens in October of 1985, showing the swirl of clouds. (NASA Photo)

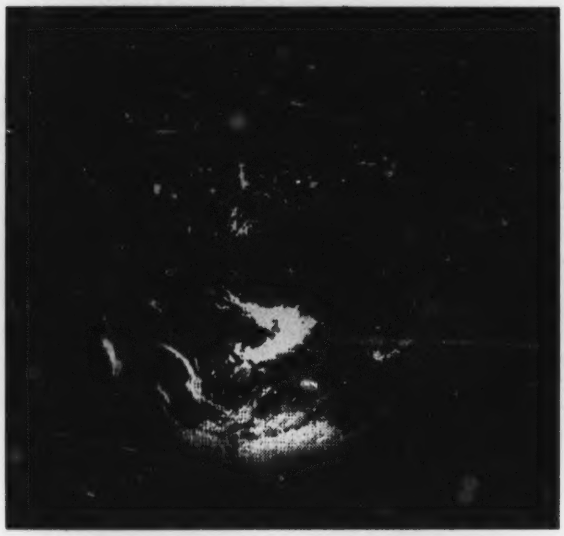
Want To Give Your Children More Space To Grow?

With the help of your children, collect rain by placing a tin can outside before a rain storm. (Tie or tape the can to a post or wedge it into a space so the wind does not blow it over.) After the storm stops, measure the amount of water with a ruler. Write down the number of inches. Do the same thing during another rainstorm. Have children compare which storm produced more rain and talk about the clouds that produced the rain.

The Earth

DESCRIPTION

The concept of the Earth being round like a globe is too abstract for preschoolers to understand because they experience Earth as a flat surface. However, experimenting with a world globe, children will begin to think about the Earth as round. If they have discussed the Moon in class, there is a basis from which to discuss how we also live on a planet which has the same shape as the Moon.

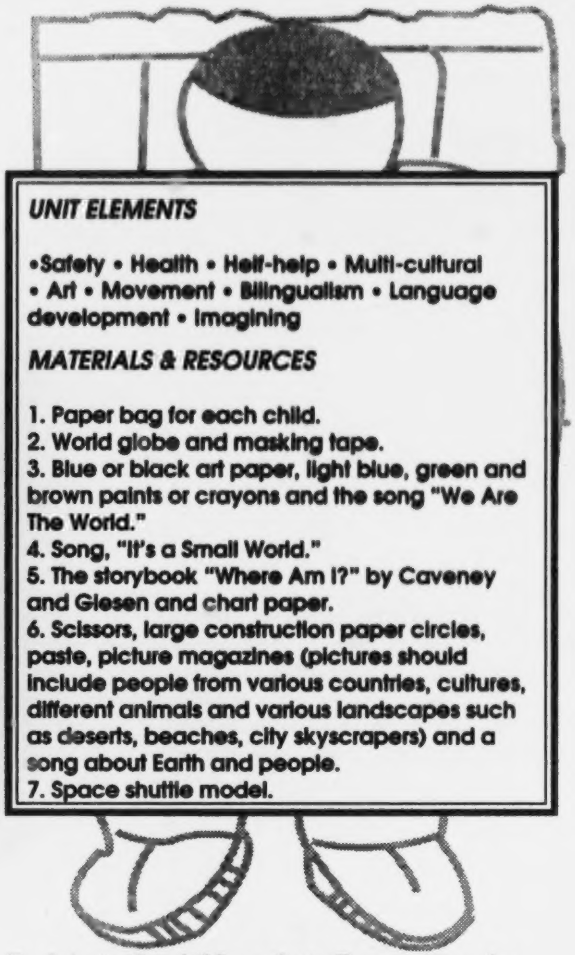


Photograph from space of the Earth, taken from the Apollo 17 spacecraft. (NASA Photo)

ACTIVITY

1. Talk with the children about the need to keep their things clean and neat. For example, the children should help wipe their tables after they eat. They should put things back on shelves when they are finished playing in the classroom. Talk about why this is important.

2. Take a group of children to the playground or nearby park (with a paper bag for each child) for a clean-up field trip. Explain that all of us who share the Earth have a responsibility to help keep it clean. Talk about why this is necessary.



UNIT ELEMENTS

•Safety • Health • Self-help • Multi-cultural • Art • Movement • Bilingualism • Language development • Imagining

MATERIALS & RESOURCES

1. Paper bag for each child.
2. World globe and masking tape.
3. Blue or black art paper, light blue, green and brown paints or crayons and the song "We Are The World."
4. Song, "It's a Small World."
5. The storybook "Where Am I?" by Caveney and Giesen and chart paper.
6. Scissors, large construction paper circles, paste, picture magazines (pictures should include people from various countries, cultures, different animals and various landscapes such as deserts, beaches, city skyscrapers) and a song about Earth and people.
7. Space shuttle model.

Explain to the children that all countries who are involved in space exploration have promised (that is, signed a Space Treaty) not to leave litter in outer space because outer space belongs to everyone. It is also a good time to help them classify "litter" (what doesn't belong there), such as bottle tops and paper or plastic, from "non-litter" (what does belong there), such as sticks, stones and plants. Help them on this trip to pick up only the litter, debris, garbage and trash.

Assist the children as they pick up debris and ask them how they feel about helping to keep the Earth clean.

The Earth

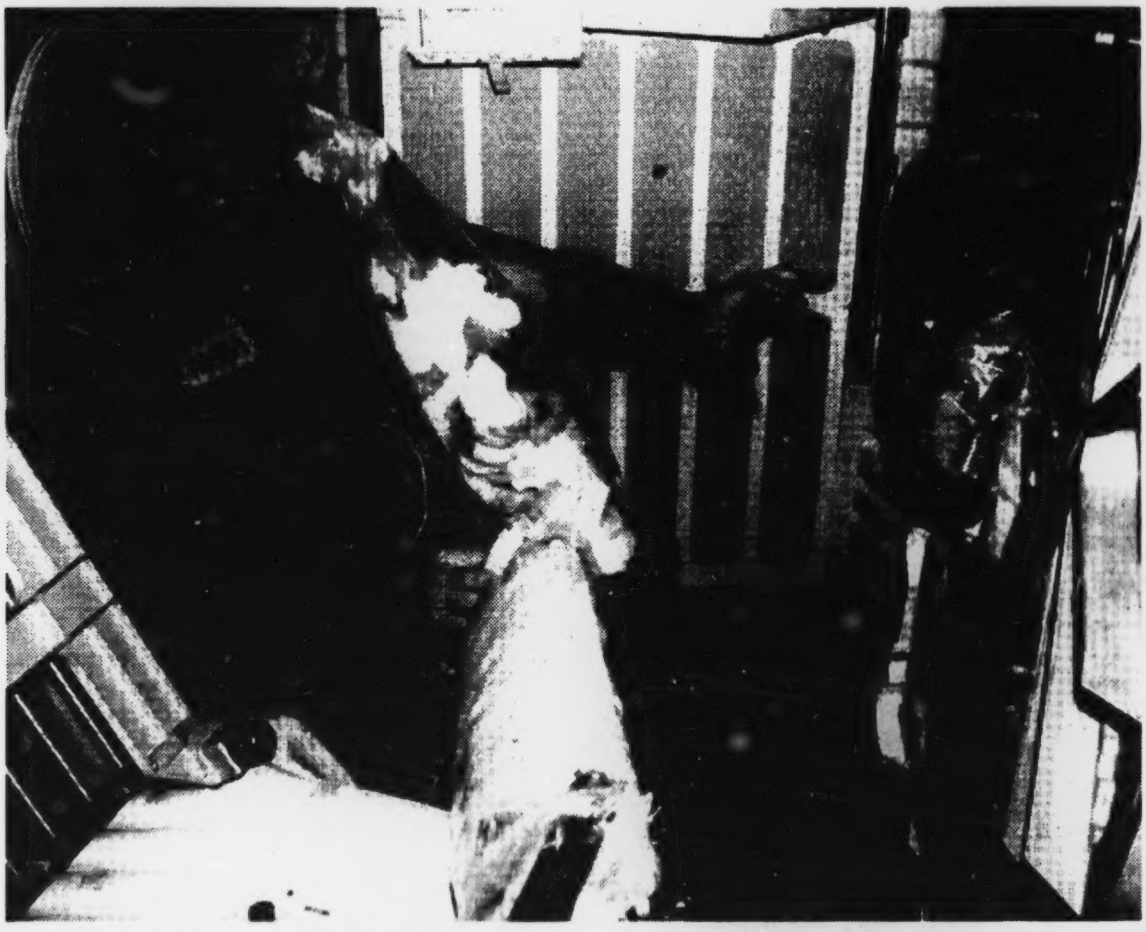
3. Take children and a world globe outdoors. Show them the globe and where they live on it. Mark that spot with masking tape or some other visible means. Point out a couple of other distant countries. If you have completed the Sun unit, point to where your children live and mention that while it is daylight where they live, it is nighttime on the other side of the globe.

Rotate the globe and point to a couple of countries where this is true. Place the globe in an open space and walk away from it.

Notice how the globe seems to get smaller and smaller as the children get further and further away from it. Discuss that this is the same view astronauts have of Earth as they leave the sky and our atmosphere and go into outer space. Tell the children that all astronauts, from all countries, say that seeing the Earth from a spacecraft is the most beautiful thing they have ever seen.

4. Show the picture of the Earth (don't call it by the name, "The Big Blue Marble," for preschoolers) and explain that is the way Earth looks to astronauts when they are in outer space.

Tell children that from outer space, Earth looks



Photograph of a week's worth of trash in the mid-deck area, demonstrating that solid waste and its handling is as important in space as it is on the Earth. (NASA Photo)

The Earth

like there are only four colors: blue, green, brown and white. The oceans are green and blue, while the clouds are white. All the people on Earth share the brown part which is the smaller part of Earth.

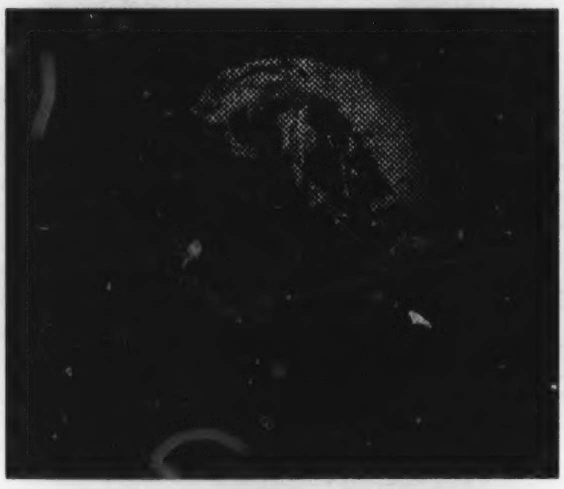
5. Take children back into the classroom and give them blue or black art paper and light blue, green and brown paints or crayons. Invite children to draw what they think the Earth looks like from outer space. While children are drawing, play the song, "We Are The World", and encourage them to sing along if they want .

6. Tell the children that people with different cultures, different clothes and different ways of doing things, all share the Earth. Ask children to share any experiences they have had with someone from a different place. Maybe children know someone who speaks a language or who speaks their language with an accent. Demonstrate the sign language for "I love you" (point to yourself, cross arms over your chest, point to children) as a different language. Ask children to repeat this international language sentence. Play the song, "It's A Small, Small World," and help children sing along.

7. Read children the storybook, "Where Am I?", by Caveney and Giesen to develop the concept of children belonging to a global community. Using paper, help children reconstruct the world as they know it. Progress from their house to their neighborhood, to the shopping center, to their state, as far as they can extend the concept. Add pieces they do not know until together you have completed the sequence with the Earth and the universe.

Idea submitted by Sarasota Head Start Chapter I Program, Sarasota, Fl.

8. Let children construct "Earth Collages" by supplying large construction paper circles, scissors, paste and picture magazines. Pictures should include people from various countries and cultures, different animals and various landscapes, such as deserts, beaches and city skyscrapers. As they cut and paste, encourage children to move their pictures around on their circles. Talk about the collages when the children are finished and hang them where children and parents may look at them. Play a song which the children know about the Earth and the people who live on it.



A view from space of the North American continent, with a good view of Mexico and California (NASA Photo)

9. Keep the world globe in the classroom and make a space shuttle model available so children may experiment with them during free play time.

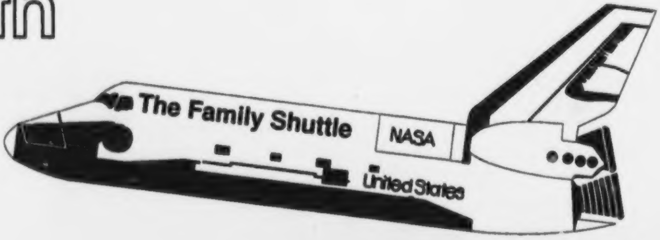
BACKGROUND NOTES

The first time we could see the whole Earth was during the Apollo 8 mission in December, 1968. The astronauts on their way to the Moon got far enough away to capture the whole Earth in a single photo. Although we experience the world as though it were flat, it is a giant ball about 7000 miles across.

The Earth

Photograph from the Moon of the Earth, taken from the Apollo 8 spacecraft. (NASA Photo)

The Earth



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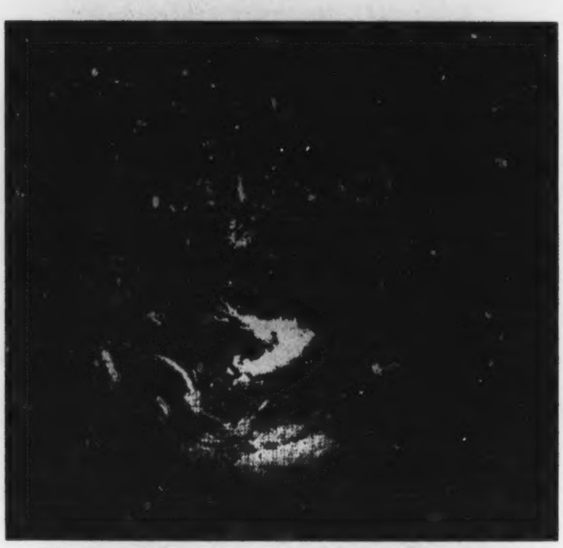
ACTIVITY

Your child is starting to learn that the Earth is not flat. In class, children are being told that they share responsibility for keeping the Earth clean and not to litter. They also are learning that we share this planet with many different people who have different customs, habits and ways of thinking about things. Preschoolers believe what they see and what they already know to be true according to their experiences. It is natural for them to think of the world as flat, to view the Earth as their own neighborhood and to have the conception that all people are similar to them.

Photograph from the Moon of the Earth, taken from the Apollo 8 spacecraft. (NASA Photo)



Photograph from space of the Earth, taken from the Apollo 17 spacecraft. (NASA Photo)

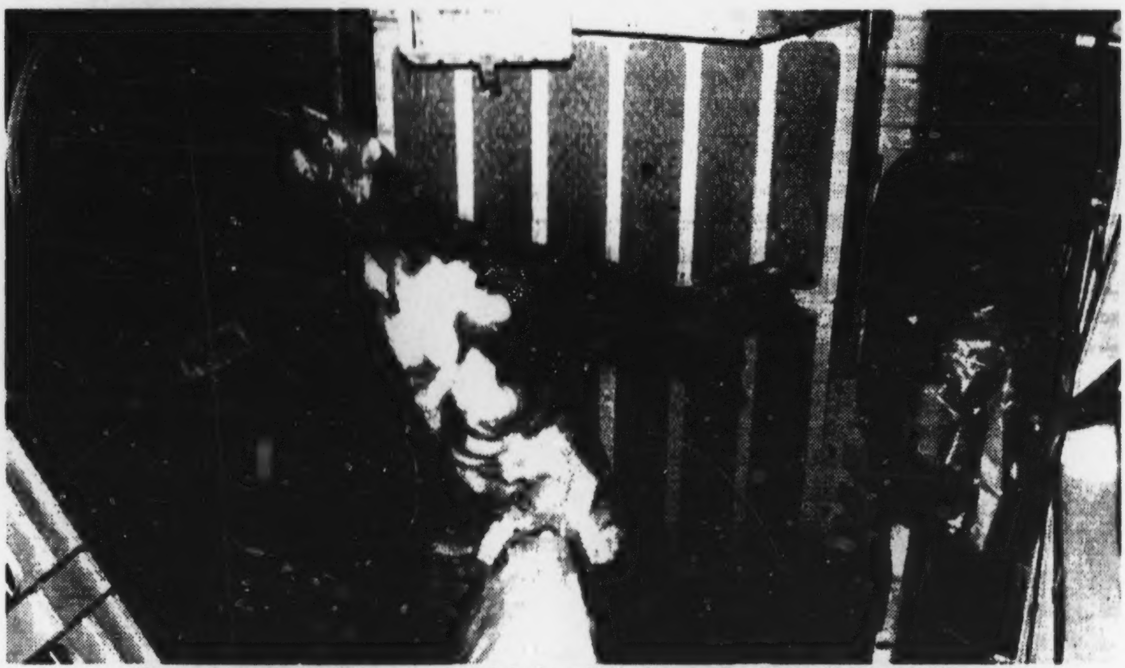
By having the family participate in these activities, you may help your children balance their self-importance in the world with the knowledge that they share the world with others who also have rights and responsibilities.

1. Take a walk with your family in a park or some other common area which all people in your community share and pick up litter in paper bags. Talk about how litter is unsightly and clutters the ground. Talk about how unsafe litter may be. Explain that a broken bottle may result in cuts and gashes in people. Help your children realize how unhealthful old garbage can be. Germs, bacteria and viruses are invisible things which may make people and animals sick. These things might grow in garbage. Discuss any other reasons which your children may have for cleaning up. Tell your children that many countries of the world have signed an agreement not to litter in outer space because it belongs to all people wherever they may live.

2. Have family discussions about events in other countries that your children know about from watching television or hearing about on the radio. Listen for people speaking other languages or with different accents and talk about where these people came from. Whenever the opportunity presents itself, help children realize there are many people on Earth who are different from them and that these people are important, too.

MATERIALS NEEDED

Large ball, large paper bag.



Photograph of a week's worth of trash in the mid-deck area, demonstrating that solid waste and its handling is as important in space as it is on the Earth. (NASA Photo)

Want To Give Your Children More Space To Grow?

Help your children learn that the Earth is a round globe by looking some evening at a Full or (close to Full) Moon in the sky. Ask your children to tell you what they know about the shape of the Moon. Help them if they do not know. Tell them the Earth is the same shape as the Moon. Show your children a beach ball or another large ball from a distance. Talk about shapes and help them understand the concept of a globe and that its outline shape is a circle.

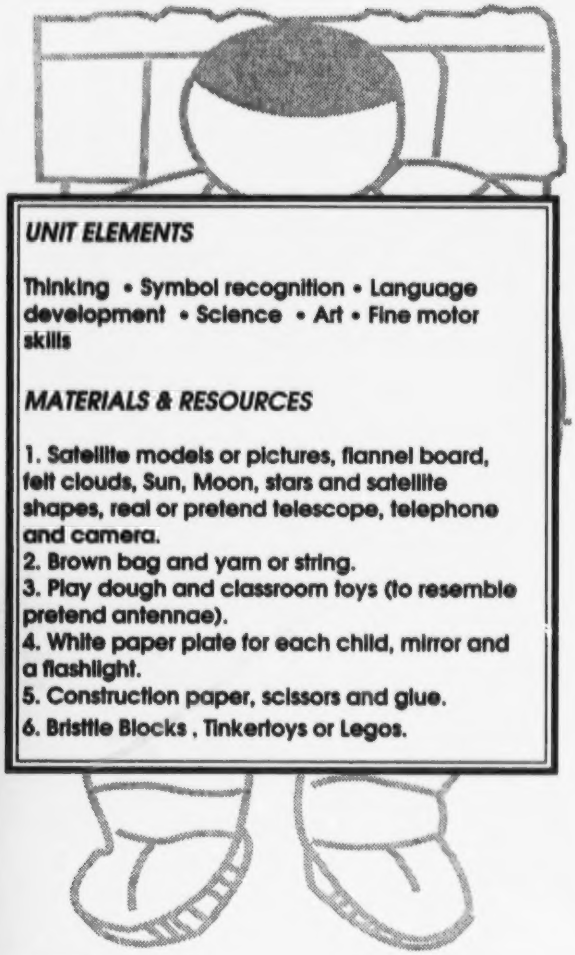
The Satellites

DESCRIPTION

Children learn best from what they can see. It is possible for children to see a satellite orbiting above them at night. It will look like a star, but it travels at a much faster rate than stars appear to move. Check with a local astronomer or Earth science teacher for some help in tracking a satellite. This may provide a good, parental, evening activity and give the children a first-hand look at a satellite.

Obviously, satellites that children see in the sky will not give them a clear understanding of satellite shapes and functions. It will benefit the children if you place satellite models or drawings of satellites throughout the classroom a few days before you begin this unit. Let them play with and become curious about the satellites.

A satellite being launched from the cargo bay of the shuttle Columbia. (NASA Photo)



UNIT ELEMENTS

Thinking • Symbol recognition • Language development • Science • Art • Fine motor skills

MATERIALS & RESOURCES

1. **Satellite models or pictures, flannel board, felt clouds, Sun, Moon, stars and satellite shapes, real or pretend telescope, telephone and camera.**
2. **Brown bag and yarn or string.**
3. **Play dough and classroom toys (to resemble pretend antennae).**
4. **White paper plate for each child, mirror and a flashlight.**
5. **Construction paper, scissors and glue.**
6. **Bristtle Blocks , Tinkertoys or Legos.**

ACTIVITY

1. Discuss with the children things which they know to exist in the sky. On a flannel board, let children add clouds, Sun, Moon and stars as they provide that information. Tell children that there is something else in the sky— satellites. Place a flannel satellite on the board and let children practice the word.

Show them models or illustrations of satellites. Have a real or pretend telescope, telephone and camera available. Ask children if they recognize

The Satellites

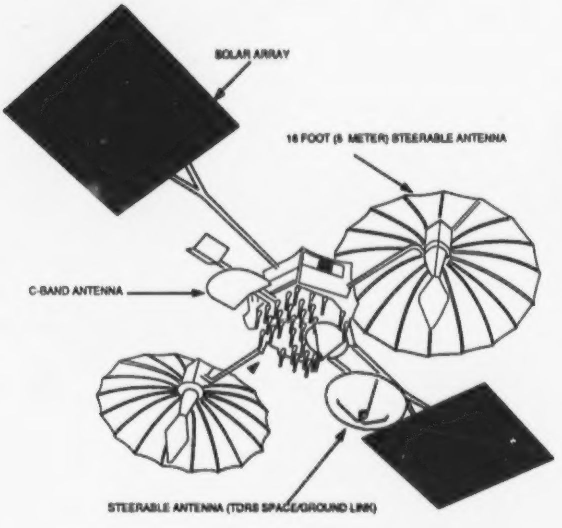
these objects and talk about what each does. Discuss looking at far away things and making them look close, communicating with people who are not in the same room, and photographing things to look at later or to send to someone. Tell children that satellites are containers to hold very complicated telescopes, telephone equipment and various cameras.

2. Ask four children if they want to help you pretend to use a "satellite." Let one child be in your city, a second child be a communications satellite, a third child be in a different place of his/her choice and a fourth child act as the satellite signal.

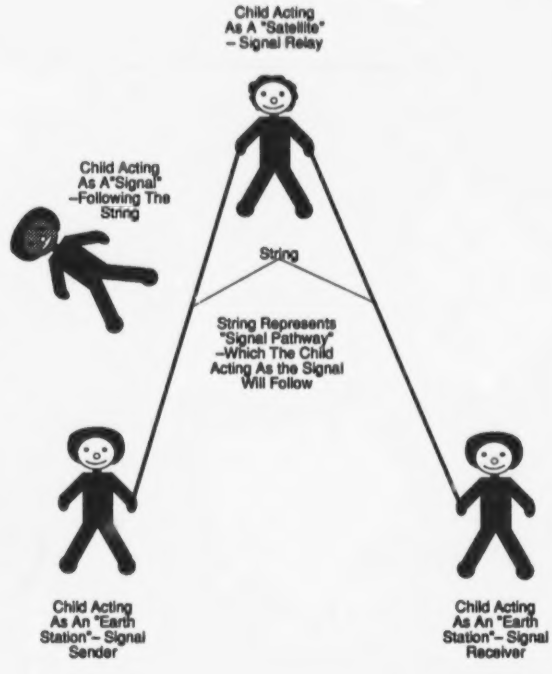
Have the first three children positioned at different places in the room with the child as "the satellite" between the other two who are "on Earth." Have all three children hold a piece of yarn in their hands as if they were holding a clothesline. Place an object in a small brown paper bag, close the bag and put a hole through the bag so that you may slip it on the yarn or cord. Have the fourth child slide the bag from Earth to the satellite and then to the second spot on Earth. Allow the receiver of the message to open the bag and show the class what you sent.

Let the children take turns playing the various roles and then discuss the process with them.

3. Give the children play dough, pipe cleaners, paper clips and plastic lids for antennae and appendages so they can talk about and make a satellite. Talk about satellites when they are finished.


SOLAR ARRAY
16 FOOT (5 METER) STEERABLE ANTENNA
C-BAND ANTENNA
STEERABLE ANTENNA (TDRS SPACE/GROUND LINK)

The above artist rendition of a tracking and relay satellite is typical of the types of satellites which are in orbit around the Earth providing valuable information concerning weather and communications. (YAC Illustration)


Child Acting As A "Satellite" – Signal Relay
Child Acting As A"Signal" –Following The String
String
String Represents "Signal Pathway" –Which The Child Acting As the Signal Will Follow
Child Acting As An "Earth Station"– Signal Sender
Child Acting As An "Earth Station"– Signal Receiver

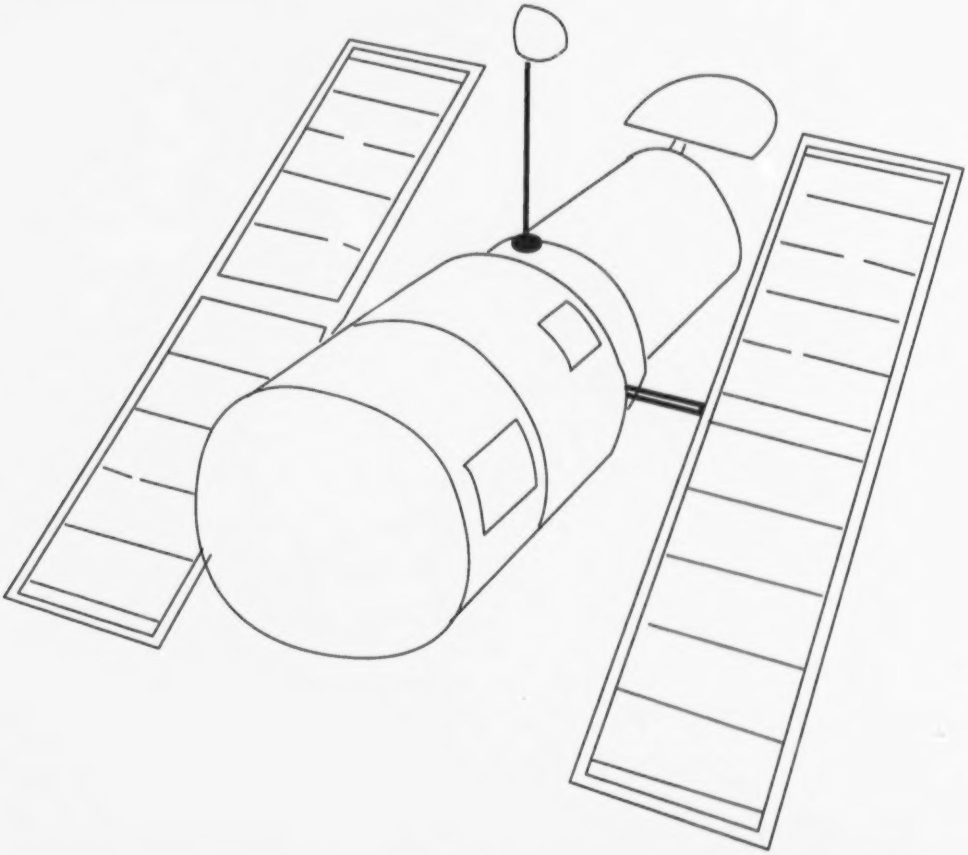
The above illustration shows how children can play satellite, as described in Activity #2 (YAC Illustration)

The Satellites

4. Create another, more abstract, satellite transmission for the children. Give each child a white paper plate to be a satellite dish on Earth. Spread the children throughout the room. Darken the room and tell the children to pretend that they are satellites receiving a television show. Using a hand-held mirror above your head and a flashlight, shine the light onto the mirror and reflect it to a child's paper plate. Explain that you are a TV station far away and that you are sending programs up to the satellite which sends them back to the children's dish satellites on Earth. As you shine the light on their plates, ask them what television show they have chosen to watch.

5. Supply different colors of construction paper, scissors and glue for making satellites. Hang the satellites throughout the room for children and parents to see.

6. Make available other classroom construction toys, such as Bristle Blocks, Tinkertoys or LEGO, and encourage children to experiment with them.



The Hubble Space Telescope, a satellite which will allow a greater opportunity to study the universe without interference from the Earth's atmosphere. (YAC Illustration)

The Satellites

BACKGROUND NOTES

Manufactured, artificial satellites (the Moon is a natural satellite) have been orbiting the Earth since 1957 when the Soviet Union launched Sputnik I. Satellites are owned both by governments and private business. They perform many useful functions. They take pictures of the temperature of the Earth in order to help locate valuable substances such as oil and minerals. They take pictures of clouds and their movements to predict storms in order to save lives and property. These pictures also help ships at sea and aircraft pilots navigate in darkness and in storms.

Satellites also transmit enormous amounts of communication. Radio, TV and telephone signals are produced on Earth and beamed up to special satellites which direct the signals back down to Earth.

Satellites move very fast in the sky. Satellites typically have panels that collect solar energy which is converted into electricity to operate the satellite. See Kerrod, "Space Shuttle," p. 57, for a photo of a solar shuttle panel that, when folded, is only seven inches thick.

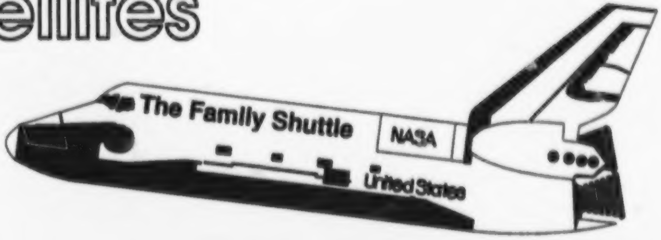
The Hubble Space telescope will be carried into space aboard a shuttle. It will allow scientists to see seven times further into space than ever before, as it is above the Earth's hazy atmosphere. It consists of a telescope, instruments that communicate what is seen by people on the ground, and solar panels.

On a clear night, one can sometimes see satellites making their way across the sky— faithful orbiters and watchers of the Earth.

NOTES

A satellite being maneuvered by an astronaut in space. (NASA Photo)

The Satellites



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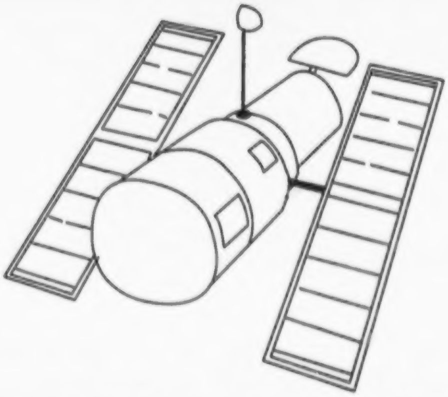
A satellite being launched from the cargo bay of the shuttle Columbia. (NASA Photo)



The Hubble Space Telescope, a satellite which will allow a greater opportunity to study the universe without interference from the Earth's atmosphere. (YAC Illus.)

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The Satellites

A satellite being maneuvered by an astronaut in space. (NASA Photo)

Although very few children will have an opportunity to see a satellite up close, they are exposed daily to parts of a satellite system. Television cable "dishes" are widely used both on rooftops in cities and in yards of rural homes to collect satellite television shows. If your family has a portable radio or television, it probably has an antenna which collects transmitted signals. Perhaps some of those signals are from a satellite transmission.

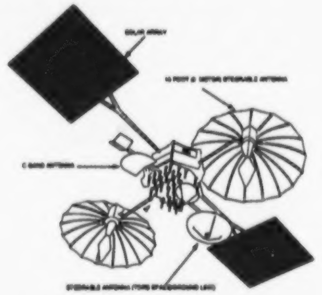
Discuss with your children how satellites generally work. Look around the house and outside and identify other possible equipment used with satellite transmissions. Talk about how satellites allow many people to see and hear things on television and radio, for instance, which they could not otherwise see or hear.

ACTIVITY

Children are learning about satellites in school. There are satellites orbiting the Earth which are visible to the naked eye during the evening. Artificial satellites travel much faster across the sky than do stars and are therefore more easily identified with the naked eye. This presents an opportunity to have an evening stargazing activity. A local astronomer or an Earth sciences teacher will help locate a satellite in the sky (if one is visible in your area), as well as explain and discuss stars and constellations. See if you can spot a satellite as you look up at the night sky.

MATERIALS NEEDED

Telescope or binoculars (optional).



The above artist rendition of a tracking and relay satellite is typical of the types of satellites which are in orbit around the Earth providing valuable information concerning weather and communications. (YAC Illustration)

Want To Give Your Children More Space To Grow?

If a telescope or a pair of binoculars is available, let your children look through them. Explain to the children that some satellites contain telescopes and enable scientists who study the stars (astronomers) to see many stars and additional planets that the human eye cannot see.

Living In Space

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Creative Movement ....Page 4.20.1

(Unit #20)

Space Exploration

The space age began in October of 1957 when the Soviet Union put a basketball-sized satellite above the Earth's atmosphere into space. Because the United States and the Soviets were rivals, each tried to outdo the other and progress in space exploration was rapid. By 1959, the Soviets had flown a small, unmanned spacecraft out to the Moon. By 1962, the U.S. had a spacecraft fly by Venus and send back scientific information. But the real excitement came when people began to fly. Here, the Russians also fired the opening round. On April 12, 1961, Soviet Cosmonaut Yuri Gagarin went around the world in about 90 minutes - one orbit of the planet.

May 5, 1961, saw the United States respond with a flight that arched up into space and fell to a landing site 500 miles away. Only 20 days later, President John F. Kennedy announced that we should go to the Moon before the decade was out. It was like starting a stopwatch. The race for the Moon was on!

Flying first the one-man Mercury spacecraft and then the two-man Gemini spacecraft, American astronauts built flight experience for the journey to the Moon. Three people were needed for the Apollo lunar expeditions. Two would fly the spider-like Lunar Module to the surface, while the third remained in the gumdrop-shaped Apollo command module, orbiting the Moon. This "gumdrop" would then take them home to splash down in the ocean using parachutes. On July 20, 1969, astronauts Neil Armstrong and Edwin "Buzz" Aldrin set foot on the Moon. Human beings, launched by the mightiest rocket the world had ever seen, were actually walking on the Moon.

Space

NASA Photo

Television brought it right into our living rooms. Over one billion people around the world watched as the astronauts bounced around in the lower gravity of our Moon. There were a total of six landings on the Moon with the last mission in 1972.

Using Apollo hardware, left over when Congress cancelled several flights, NASA engineers created a space station called Skylab. Three crews visited Skylab, with the longest crew staying in orbit for three months. The crews studied the Sun, the Earth and themselves to learn about how well humans would be able to live and work in space for longer periods of time.

The last Apollo mission was a 1975 joint link-up with a Soviet spacecraft called Soyuz (soy-yooz'). As the two spacecraft orbited together and the astronauts and cosmonauts visited each other, it marked the beginning of a new era in space travel. The Soviets were starting to launch space stations while the U.S. was developing a reusable spacecraft with wings– the space shuttle.

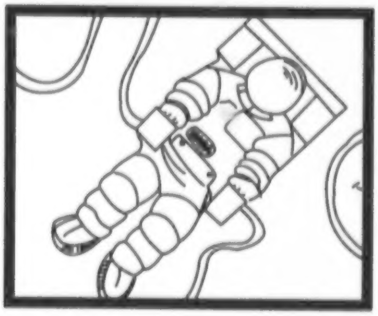
The space shuttle is part rocket, part spacecraft and part glider. Each orbiter (Columbia, Atlantis and Discovery) can make up to 100 trips into space. The first twenty-four flights established many records. Crews of men and women (crews as large as seven members), launching, repairing and rescuing satellites, all were part of the shuttle program. The loss of Challenger in January, 1986, forced the space program to slow down, fix some serious design problems and rethink many things. The resumption of flights will put us into a new era - an era that will see a return to the Moon, the establishment of a permanent U.S. space station and, possibly, a mission to Mars.

Required Materials

LIVING IN SPACE REQUIRED MATERIALS FOR THE CLASSROOM

Things to Collect

Large appliance box or indoor climber and sheet
Materials for controls and instrument panels, such as wire, gears, pipes, wheels, radio parts, tools, spools, buttons, clock dials
Shoe box per child
Picture magazines
Plastic dropcloths
Duct tape
Small grocery boxes
Brown paper bags, grocery bags
Role-playing hats and identifying accessories
Styrofoam meat trays
Arm-length strips of cardboard
Two plastic bottles and towel
Heavy winter clothing, heavy gloves
Tape recording of simulated lift-off sounds
Plastic soda bottle per child
Drinking straws or flexible tubing
Yarn, nylon rope, string
Ice cream or potato chip tubs or large milk or bleach jugs
Colored cellophane
Seeds or dirt or sand
Toilet tissue tubes, paper towel tubes
Flags
Guessing sock with common objects inside
Tape of common sounds
Pictures of community workers, firefighters, children dressed for cold weather, space shuttle cross section, astronauts in spacesuits

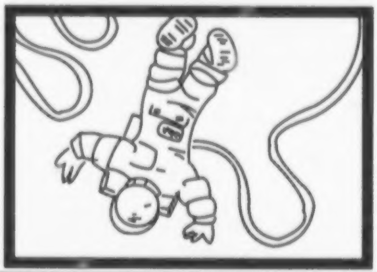


Box with dividers
Color-coded washcloths or towels and matching swatch of fabric for each child
Hotel-size bars of soap
Three-foot-square boxes
Magazine pictures of Earth, space, people of different cultures
Elastic

Required Materials

Supplies

- Glue, scissors
- Chart paper, art paper, construction paper
- Paper clips
- Pencil, markers, crayons, paint
- Masking tape
- Clear plastic wrap
- Felt pieces: yellow, red, gray
- Drinking straws
- Toothbrushes, toothpaste
- Paper towels or washcloths
- Small plastic bags and twist ties, large plastic bags
- Materials to make signs
- Food coloring
- Pipe cleaners
- Popsicle sticks
- Paper streamers
- Small, brown paper bags
- Assorted food: sugarless instant drink, apples, canned pie, lemon juice, dried fruit, nuts, sunflower seeds, grapes, pudding, six to eight dry snack items
- Ingredients for fruit leather, beef jerky, Piroshki (see recipe following this list)



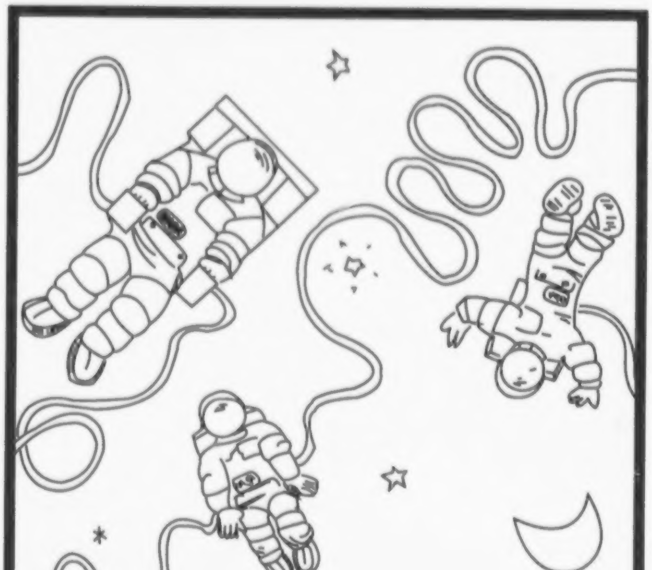
Materials and Resources

- "Youngest Astronaut" storybook
- "Mooncake" by Frank Asch or story about space exploration
- "Let's Go to The Moon" by Michael Chester
- "It's All Right to Cry" from "Free to Be You and Me" by F. Klagsbrun
- Story about children outdoors in cold weather such as "A Snowy Day" by E.J. Keats
- Story about growing fruit or vegetables
- NASA Publication NF-150/1-86, "Space Shuttle Food Systems"
- Storybook about nighttime and sleeping
- Space shuttle model
- Portable fan (optional)
- Flannel board
- Zipper & button frames
- Magnifying glasses
- Binoculars, telescopes, camera (optional)
- Material for space suits
- Hoola hoop or spliced section of garden hose
- Rock and plant resource books
- Teaspoons, measuring cup, paring knife, bowls, spoons
- Scale
- Material for sleeping bags, pillows and eye masks, Velcro
- Pictures of astronauts sleeping in the space shuttle
- Pictures of astronauts eating in the space shuttle
- Space-associated music with no lyrics

Required Materials

Materials and Resources (continued)

Space adventure or fast beat music
Lively music for dancing
Sink or plastic dishpan
Housekeeping equipment, sleeping cot
Suitcases
Yard sticks, meter sticks, rulers
Blocks
Story about different professions
Magnets, metal and non-metal objects

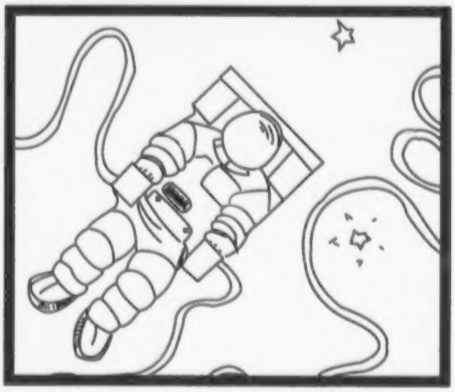


Required Materials

LIVING IN SPACE REQUIRED FOR FAMILY ACTIVITES

Required Materials

Sheet and two chairs, a stack of pillows or a large appliance box
"If You Were an Astronaut" by Dinah Moche
Snack such as dried fruit or carton of juice
Socks, belts or sashes to braid together
Gallon milk carton, bleach jug or card board ice cream tub
Colored cellophane or plastic wrap
Crayons, felt markers, pencil
Glue, scissors
Camera (optional)
Paper, tape
Shoe box or other small box
Paper bag
Sock with common objects inside
Small jars
Cotton balls, scents such as vanilla flavoring, vinegar, lemon or orange slices, pickles, pieces of soap
Paper compass
Several layers of clothes, gloves, hood or helmet
Paper towel tubes or empty egg carton
String or yarn
Instant pudding, measuring cup, small plastic bags, twist ties, ingredients for a meal made from dried food
Peaches, apples or other fresh fruit, paring knife, tray, oven, ingredients for fruit leather
Two-foot by eight-foot piece of material, safety pins, pillow
Story book about outer space, Moon or stars
Handkerchief or scarf or piece of material for eye mask
Three-foot-square boxes
Magazine with pictures of Earth, space and people of different cultures
Cardboard (or paper)
Sink or dishpan
Light and airy music



Building A Spacecraft

DESCRIPTION

For many Americans the space shuttle represents routine space travel by people. For preschool children it is the only reference they know for space adventure. Despite the tragic Challenger accident, space exploration will continue. For the foreseeable future the space shuttle, which is the collective title for the orbiter, two solid fuel boosters and the large liquid fuel booster, will be the primary means of getting people into outer space.

By fostering children's creativity as you help them build an orbiter, you have the opportunity to present children with a host of developmentally appropriate, cognitive activities. Space exploration means taking your living environment with you. This microcosm provides many opportunities to focus attention on specific social skills while the children pretend to be traveling in space.

The unit also presents a good opportunity to directly involve parents in the classroom. They may construct permanent mission control and shuttle models for the science corner in the classroom, just as refrigerators, sinks and ranges are part of housekeeping.

ACTIVITY

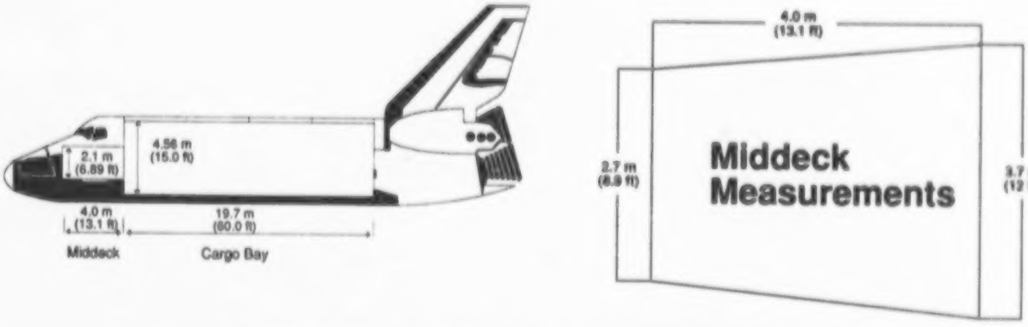
1. Read or reread "The Youngest Astronauts" storybook to the children.

UNIT ELEMENTS

• Language development •Science • Classifying •Imagining • Social relationships •Problem solving • Thinking • Labeling • Math •Fine-motor skills • Eye-hand coordination

MATERIALS AND RESOURCES

1. "The Youngest Astronauts "storybook.
2. Picture of space shuttle and cross-section picture.
3. Space shuttle model.
4. Large appliance box or indoor climber with bed sheets, materials for controls and instrument panels (glue, wires, gears, pipes, wheels, spools, buttons, clock dials, radio parts and tools).
5. Chart paper.
6. Blocks.
7. Shoe boxes, picture magazines, scissors and glue.
8. Plastic dropcloths, duct tape and a safety protected portable fan.



The above figure shows the various dimensions of the shuttle orbiter. (YAC Illustration)

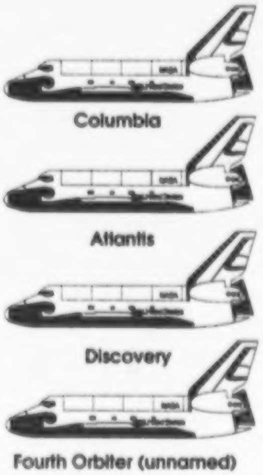
Building A Spacecraft

2. Ask children how they think astronauts get into space. Show a picture of a space shuttle. Show them a picture of the orbiter with the upper level, mid-deck and payload bay plainly visible. Encourage children to talk about all the instruments they think are on an orbiter. Ask them to name the other vehicles they may know which have instruments (for example, a school bus or a car). Ask them what kinds of instruments cars have and if a space shuttle orbiter would have the same ones.

3. Show the children a space shuttle model and where astronauts ride during a launch, where they work, and point out the large size of the cargo bay. Discuss with the children why they think the cargo bay is so large. What kinds of things would the children put in the cargo bay?

4. Ask children if they want to make a pretend space shuttle. Tell them that this requires a lot of cooperation and planning. Provide them with a large appliance box or other large box from grocery store or an indoor climber with bed sheets. Have on hand a wide assortment of materials for controls and instrument panels, including such things as paste, wires, gears, spools, buttons, clock dials, pipes, wheels, radio parts and tools. Help children think about food, sleep, work, exercise and personal hygiene when they plan their orbiter.

The process of deciding, negotiating and carrying out plans is much more important than any final product. Let children work together by choice, making sure they have as many turns as they wish. Ensure that everyone who wishes has a continuous role. Encourage and support children's creativity as they experiment and realize the need for something for which they had not planned previously. Prompt them with responses to their activity, which include open-ended questions, such as "Will you have controls?" or "How does it steer?



Maybe the children can think of a name.
(YAC Illustration)

5. Tell children the names of the current space shuttle orbiters: Columbia, Discovery and Atlantis. Tell them that when we name something, the name usually has a special meaning. Supply a few examples from your community, such as streets or school buildings, to reinforce this point. Ask the children to suggest names for their space shuttle while you write them on paper. Let the group decide on a final name. Share the success of the project by sending a photograph of your shuttle along with a description and the name to: Regional NASA Teacher Resource Centers (*See Resource Guide in the Appendix for the listing of specific address*). Send an additional copy to the local newspaper.

6. Encourage children to experiment and extend the play by such ideas as building (a) a temporary back-up by constructing a launch or landing area and a space station or (b) second spacecraft from wooden blocks in the block area (especially if you need area for more children to do this dramatic play at one time).

7. Use the spacecraft and other constructed items for dramatic play throughout the year, and be alert to the possibilities of extending the play with new props.

8. Provide children with a space shuttle made from an open shoe box with three partitions representing the upper-level, mid-deck and

Building A Spacecraft

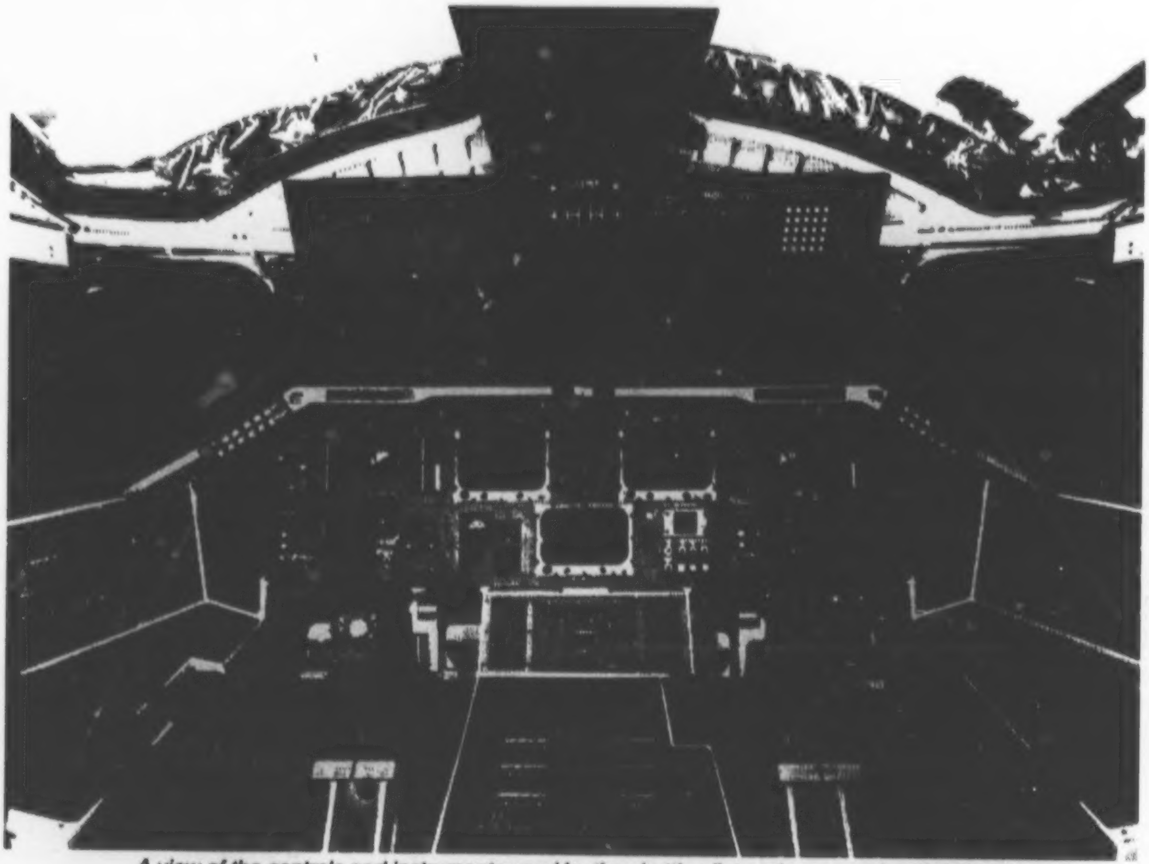
payload areas. Supply them with picture magazines, scissors and glue to decorate their shuttles. Ask them to name their spacecraft.

9. Construct an inflatable spacecraft for the children. They will enjoy climbing into the spacecraft and pretending to be in outer space as they learn about space travel. Many small group activities may be performed in this shuttle model.

Build the inflatable spacecraft from two, inexpensive, plastic dropcloths, a roll of duct tape and a portable fan with encased blades (and therefore not dangerous to children). Place one drop cloth on top of the other and duct tape the two long sides and one short side together. Enclose the fan in the opened end and fasten the drop cloth to the fan's body. Make a small door by cutting a two-foot-square patch on three sides in the drop cloth. Velcro the three sides of the cut door to allow children to get in and out without deflating the spacecraft too much. Turn the fan on to ensure that the drop cloths inflate properly.

Safety precautions should be taken if you use this activity. A responsible adult should always be in the craft when children are there. Make sure the fan is enclosed and in good working order. Children should always go to the end of the spacecraft away from the fan.

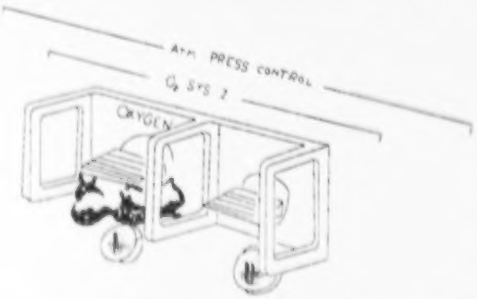
This Inflatable Spacecraft Idea was supplied by CAP Head Start, Pensacola, FL.



A view of the controls and instruments used by the shuttle pilot and commander. (NASA Photo)

Building A Spacecraft

10. Invite parents to come to the classroom while the children are actively involved with the creation of the shuttle. After the children have completed their shuttle model, parents may want to construct a permanent model for children to use throughout the year. Encourage parents to be inventive and creative with their project also.



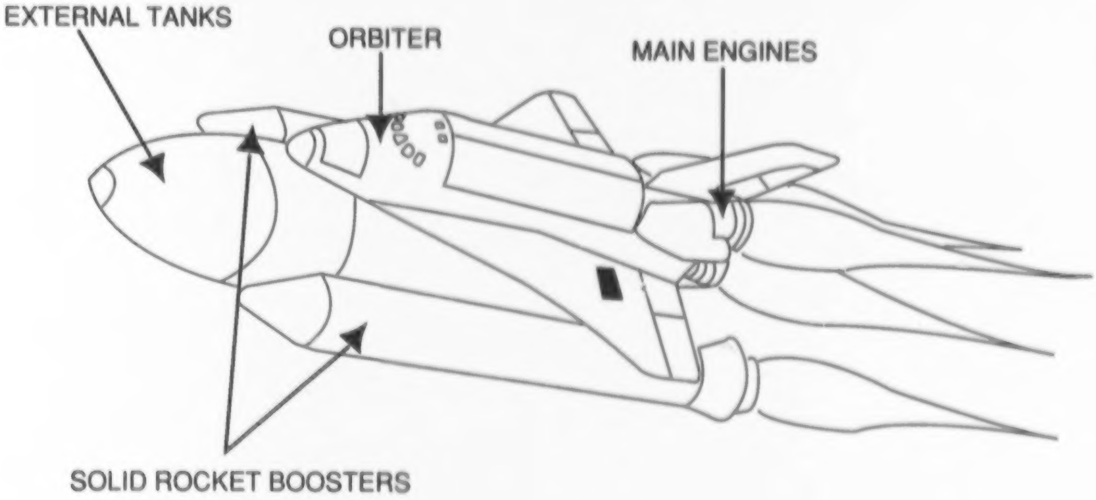
An example of "controls" from "The Youngest Astronauts" Storybook. (YAC Illustration)

BACKGROUND NOTES

Spacecraft are usually quite small and have many interesting features. In addition to providing facilities for eating, sleeping, exercising, toileting and working, the craft is both a home and an office. This makes outer space travel like a camping trip with a lot of scientific and data-processing equipment.

In your house there are many "controls": light switches, appliance switches, toilet flush handles and sink handles. Spacecraft have all of these and many others. The spacecraft has to fly, so it needs guidance and navigation controls. It must provide an Earth-like environment, so it must have temperature and atmospheric controls, and it does scientific experiments, so it must have instrument controls.

Also see "Living in Space" Unit # 8 for background.



The above drawing shows the major components of the Space Transportation System, usually refered to collectively as the "Space Shuttle". (YAC Illustration)

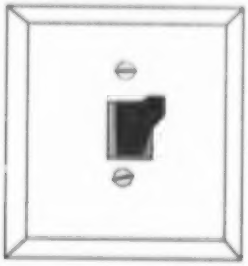
NOTES

Building A Spacecraft

The Family Shuttle
NASA
United States

BACKGROUND NOTES

Spacecraft are usually quite small and have many interesting features. In addition to providing facilities for eating, sleeping, exercising, toileting and working, the craft is both a home and an office. This makes space travel like a camping trip with a lot of equipment.



A common light switch is an example of a "control" around the home. (YAC Illustration)

A panel of switches from inside an orbiter. (From "The Shuttle Operator's Manual")

In your house there are many "controls": light switches, appliance switches, toilet flush handles, sink handles. Spacecraft have all of these and many others. The spacecraft has to fly, so it needs guidance and navigation controls. It must provide an Earth-like environment, so it must have temperature and atmospheric controls, and it does scientific experiments, so it must have instrument controls and data-processing equipment.

ACTIVITY

The children are working together in the classroom to make a pretend space shuttle. The activity helps them realize the value of cooperation and sharing. They also are learning problem solving skills as they build their craft. These are necessary skills children need. They also need specialized, one-on-one time at home since families also help develop these skills.

Promote this important contact by helping your children create their own spacecraft. As you and your children build a space shuttle, enjoy yourselves. Let the children use their imagination and be creative. Allow this place to be the children's private space, but be prepared to share the spacecraft, if you are invited.

1. Decide with your children where would be a good place to set up a spacecraft.

2. Talk about what materials you have available and how you can use them to build your spacecraft. Your shuttle may be as simple as a sheet thrown over two chairs, or a stack of pillows in a corner or as inventive as a decorated large appliance box.

3. Talk with your children and discover what they know already about space shuttles and space flight. Ask them what a spacecraft would have inside it. Discuss the need for instrument panels, steering wheels, computers and telephones. Based on what they say, help them build their shuttle to meet these needs. Ask them about food, exercise and toys. It is important for them to think about how they would talk with people on Earth, too.

Building A Spacecraft

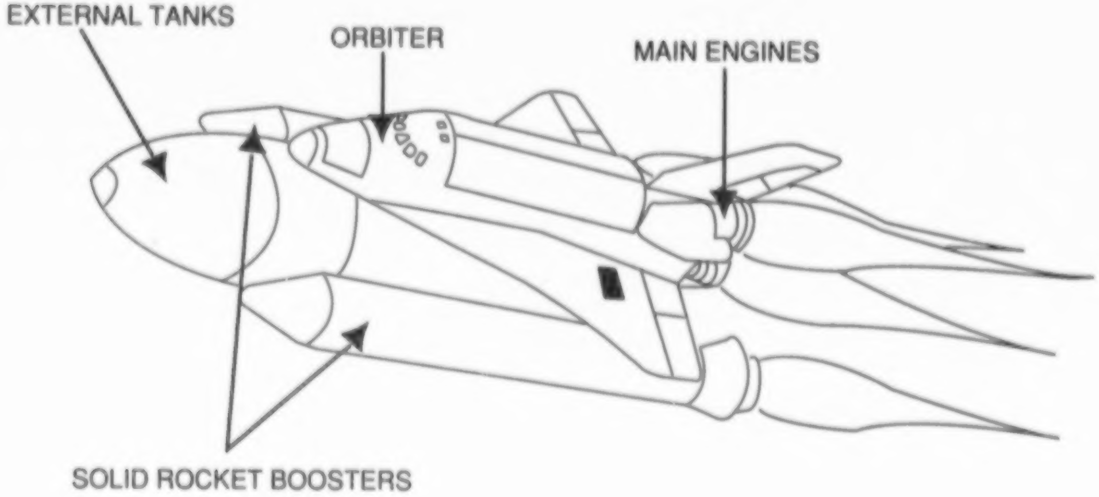
4. Let your children build their spacecraft while you supply help when and where it is needed.

5. Once the spacecraft is built, ask them where they will go in their shuttle orbiter and what they will do once they get there. Let your children pretend to be on a space mission while they are in the spacecraft. Play along with your children's ideas about life in outer space. Perhaps they will want you to be mission control on Earth and talk with them.

6. Ask the teacher for some storybooks about spacecraft and read to the children. A list was supplied with this enrichment curriculum.

MATERIALS NEEDED

Sheets and two chairs or a stack of pillows or a large appliance box.



The above drawing shows the major components of the Space Transportation System, usually refered to collectively as the "Space Shuttle ." (YAC Illustration)

Want To Give Your Children More Space To Grow?

When your family is in a car, ask them how they would think living in a spacecraft the size of the car would be. What would they need to bring along if they were going on a space journey?

Launching A Spacecraft

DESCRIPTION

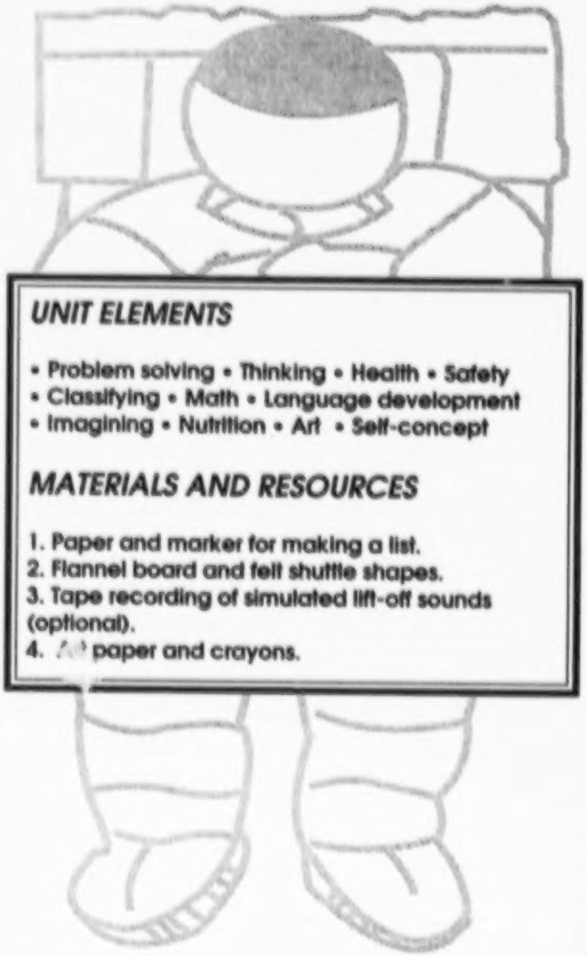
Providing children with new words and props is a way to encourage variations in dramatic play. The specialized vocabulary used during a shuttle launch helps them act out the activity with a degree of realism. In this activity, children are given a story about the sequential events for launching a spacecraft. Encourage them to be inventive and create new experiences for themselves. Avoid the temptation to script what the children will do and say.

ACTIVITY

1. Making adequate preparations is important for anything that we do, but crucial for a space launch. Discuss with your children examples of preparations they have made to do something. Going outside in cold weather requires dressing warmly, or taking a trip to the beach means gathering beach blankets, beach toys and filling the car with gas. These are examples which children may have experienced.

2. Ask the children to think about preparing to launch a spacecraft, asking things like, "What do you think people need to launch a spacecraft?" Talk about fuel and the technicians who need to prepare the solid and liquid fuel boosters. Discuss how the orbiter and the fuel boosters have to be brought together on the launch pad and secured to the pad (like we had to tie down our tin can to catch the rain, so the wind would not blow it over). Talk about all the provisions to put on board, such as food, personal items of the astronauts and equipment for experiments while in outer space.

3. Help the children make a list of all the things they think are necessary for a successful launch, record it for the group and keep it handy so all of you can refer to it throughout the activity.



UNIT ELEMENTS

- Problem solving • Thinking • Health • Safety
- Classifying • Math • Language development
- Imagining • Nutrition • Art • Self-concept

MATERIALS AND RESOURCES

1. Paper and marker for making a list.
2. Flannel board and felt shuttle shapes.
3. Tape recording of simulated lift-off sounds (optional).
4. Art paper and crayons.

Monitors are watched closely during launch. (NASA Photo)

Launching A Spacecraft

4. On a flannel board, show the launch sequence for a space shuttle. Use the attached, "A Typical Shuttle Mission" illustration by the YAC, as a guide for planning the board activity.

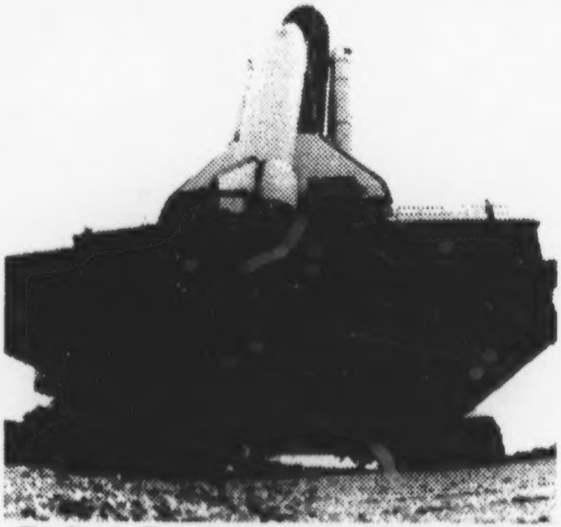
5. Practice a countdown with the children: "10, 9, 8, 7, 6, 5, 4, 3, 2, 1, lift–off." (You may want to explain that "lift–off" is at the "zero" point.)

Introduce the following terms and encourage children to practice and use them:
"Roger" means "Okay."
"Over" means "It is your turn to talk."
"Out" means "We are done talking."
"Standby" means "Wait."

6. Ask the children if they want to pretend to launch their spacecraft. Ask for volunteers to be technicians who will ready the craft for flight, volunteers who will direct mission control on Earth, and volunteers who will be the crew. (The next activity, "Working In Space," more fully describes crew positions. However for this activity, a brief description of duties through earlier discussions with children may be better.)

7. Allow "technicians" to fuel and load the cargo bay. Perhaps for this day, the children's snack could be loaded on the space shuttle and eaten while orbiting the Earth. (The support crew on Earth should share the same snack, of course.) Ask the astronauts to choose and carry their own personal items on board. Make sure mission control personnel have their own place in the classroom and have gathered equipment to talk with the flight crew once they are in the spacecraft.

8. Ask children to do a final check to make sure everything is ready for a successful launch. Have all the children participate in the countdown. A previously made, cassette tape recording of loud rumbling sounds simulating lift-off may enhance the pretend launch. Children should protect their ears during launch and then might wave good-bye to the astronaut crew. Have mission control talk with the astronauts to find out how everything is going.



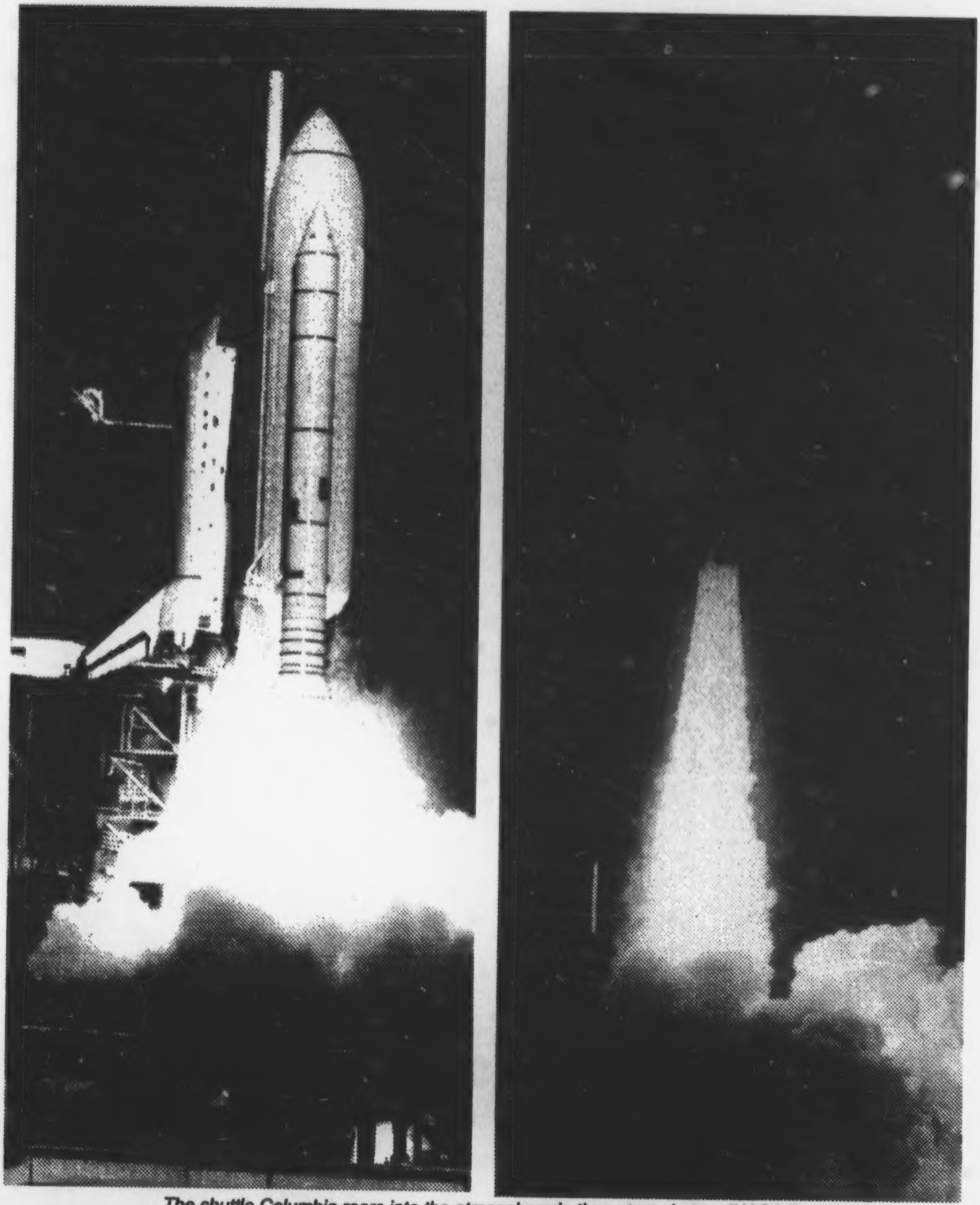
The Crawler Transporter moves a shuttle to the launch complex. (NASA Photo)

9. This could be a practice launch, and you may bring the spacecraft back to Earth at this time or you may want to encourage the crew to think about what they are seeing on their trip. You may ask the flight crew where they are going and what they will do when they get there. Let them play out their own ideas. (The next activity, "Working In Space," extends this activity and provides the basis for on-going play in a spacecraft.)

10. If the astronauts continue their flight, see to it that others who are interested have roles, too. Involve mission control with the process. Supply the technicians with art paper and crayons and ask them if they want to draw a picture of the launch. As mission control's interest fades, they may also want to draw their launch. Or they may be reporters recording the launch, for example. Discuss the art with the astronauts when they land. Or wait until the astronauts have had a chance to draw their pictures of what they saw in space before discussing all the artwork.

11. Let the children take the artwork home with them to share with their families.

Launching A Spacecraft



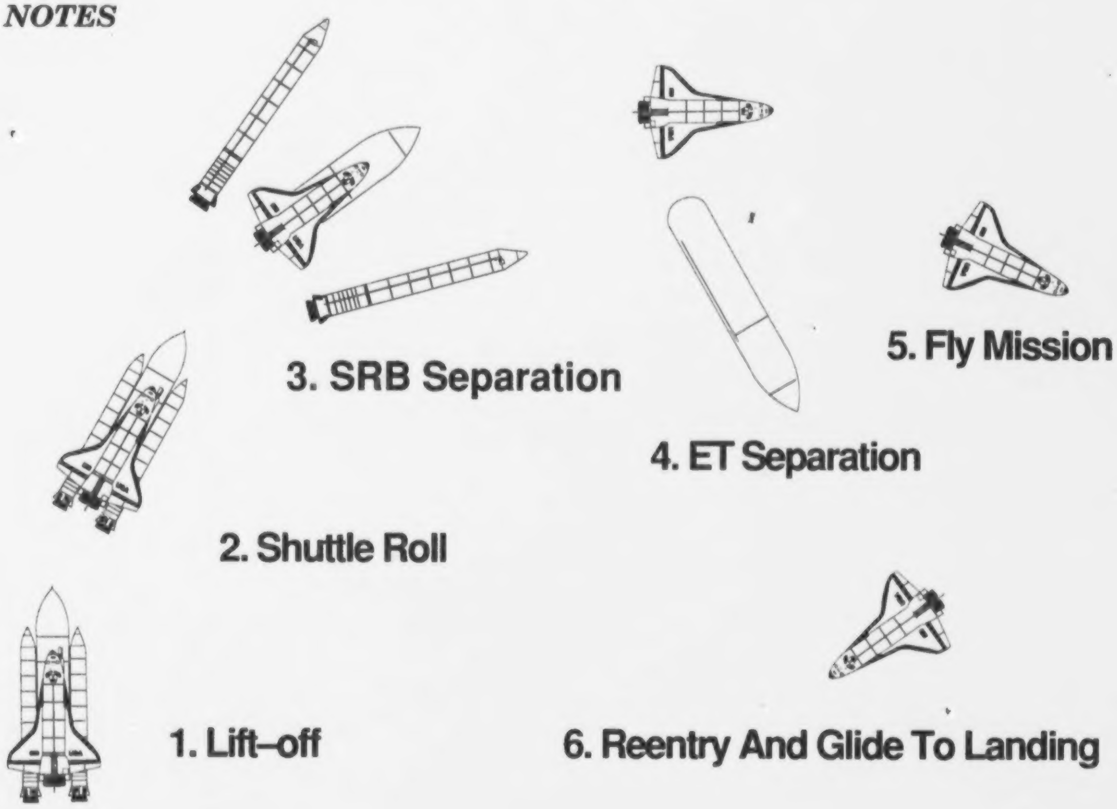
The shuttle Columbia roars into the atmosphere in these two photos. (NASA Photo)

Launching A Spacecraft

BACKGROUND NOTES

The launch is a very exciting part of a space flight. Immensely powerful rocket engines will create millions of pounds of thrust and burn tons of fuel in a matter of a few minutes. Astronauts will be hurled from a standstill to a speed over 17,000 miles per hour. They will experience tremendous forces on their bodies. It is the ultimate ride!

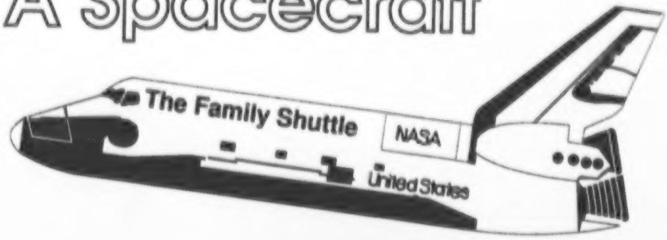
NOTES


3. SRB Separation
5. Fly Mission
4. ET Separation
2. Shuttle Roll
1. Lift–off
6. Reentry And Glide To Landing

A Typical Shuttle Mission

(YAC Illustration)

Launching A Spacecraft



BACKGROUND NOTES

The launch is a very exciting part of a space flight. Immensely powerful rocket engines will create millions of pounds of thrust and burn tons of fuel in a matter of a few minutes. Astronauts will be hurled from a standstill to a speed over 17,000 miles per hour. They will experience tremendous forces on their bodies. It is the ultimate ride!

ACTIVITY

Children at school are pretending to launch their spacecraft. They are learning new vocabulary words and the step-by-step process of preparing for a launch. This helps them think about making adequate preparations for things that they do.

By talking with your children as they launch their spacecraft at home, your family can help them use these new words, understand the importance of planning for an event and have fun at the same time. It is important to realize that as you give your children more information you help them develop their play more fully.

1. Ask your children if they want to launch their spacecraft and ask them to get into the spacecraft that your family has already made.

2. Practice the launch countdown with the children: "10, 9, 8, 7, 6, 5, 4, 3, 2, 1, lift–off."

3. Practice the following words with the children:

"Roger" means "Okay."
"Over" means "It is your turn to talk."
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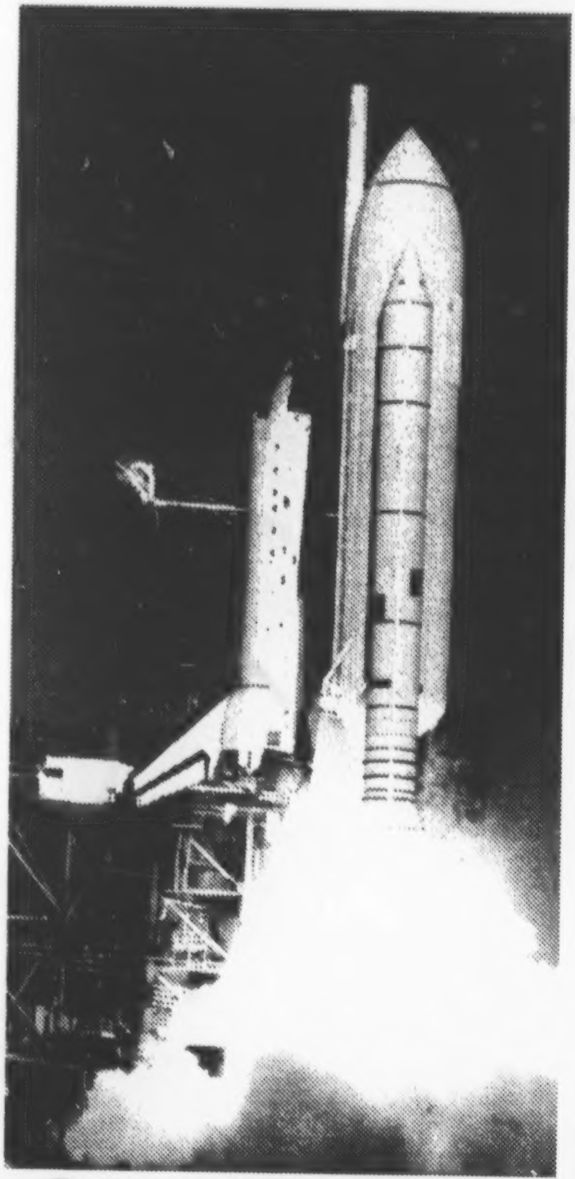


The shuttle Columbia roars into the atmosphere on its maiden flight. (NASA Photo)

Launching A Spacecraft

4. Ask your children what they think they have to do to prepare their spacecraft for launch. Discuss these things with them. Let them gather items they want to take with them.

5. Ask them if it is all right for you to be mission control on Earth.

6. Prepare for launch with your children in the spacecraft and you at mission control. Help your children launch by using language somewhat like the following:

"Spacecraft, this is mission control. Are you ready to lift–off? Over."
"Mission control, this is the spacecraft. Roger, we are ready. Over."
"Spacecraft, this is mission control. Let's countdown. Over."
"Roger, mission control. Over."
"10, 9, 8, 7, 6, 5, 4, 3, 2, 1, **LIFT–OFF**!"

Have a family member make a roar as the rockets lift the spacecraft off the launch pad. "Spacecraft, you're looking pretty. Everything is A-OK."

7. Allow children to play as they pretend to orbit the Earth. Help them by asking them some questions such as: where are they going, what will they be doing and when will they be back.

MATERIALS NEEDED

None.

Monitors are watched closely during launch. (NASA Photo)

Want To Give Your Children More Space To Grow?

1. Ask the children to describe the most beautiful thing they have seen on their pretend trip.

2. Tell your children a story of some exploring you did when you were a child.

Traveling In Space

Introduction .... **Page 3.0.1**

Weightlessness .... **Page 3.0.2**

Materials Required .... **Page 3.0.4**

Means of Transportation .... **Page 3.1.1**

(Unit #1)

Gravity .... **Page 3.2.1**

(Unit #2)

Atmospheric Flight .... **Page 3.3.1**

(Unit #3)

Make Me! .... **Page 3.4.1**

Supplemental Activities
Traveling In Space

"Traveling In Space" is offered to teachers as supplemental activities for preschool children. The concepts contained in these units, air, gravity and weightlessness, are abstract and too difficult for three to five-year-old children to comprehend.

Children will benefit, however, from the introduction of new words which are necessary for later concept formation, and they will enjoy such activities as flying gliders and dropping parachutes.

Some units, including glider, helicopter and parachute activities, require the teacher to make or at least partially assemble materials for children to use. Because these activities do not build on the previous knowledge of children, but instead rely upon teacher explanations and demonstration, they are not age-appropriate activities for preschool children by themselves.

The activities are presented to teachers who may want to begin concept formation concerning air, gravity and weightlessness with their preschoolers.

Traveling In Space

Weightlessness

Weightlessness

The idea of weightlessness is difficult for adults, let alone children, to understand, but it is an important aspect of traveling in outer space. Weightlessness is the absence of significant gravity. We live our lives on Earth, however, being "weighty." We know that something called gravity holds us to the Earth and makes everything that goes up come down again. What we do not think about is the hidden fact that while the Earth is pulling us close to itself, it is also pushing up on us at the same time. A balance is maintained between a push and a pull.

Trying to stand on water illustrates this point. If we jump out of a boat into water, we fall through it. We do not fall very deeply, however, before the water starts to push us from underneath and keeps us floating near the surface. Only in air can we fall and fall with nothing stopping us until we land. (And actually there is a "terminal velocity" in air as well.)

The idea of falling is important for understanding the feeling of weightlessness. Being weightless in space is like falling without the anxiety of crashing into something and getting hurt. Weightlessness, of course, applies to objects as well as people. Tons of equipment can be pushed around in outer space with minimum effort. Pencils, books, food and tools may just float away if they are not secured to something stable.

To train for weightless conditions during space flights, astronauts fly at high altitudes as passengers in a large jet cargo plane. This padded airplane with everything removed makes one to two minute "dives" which make the astronauts feel weightless. During these short periods, they practice maneuvers and tasks that they will perform in outer space.

Weightlessness

(NASA Photo)

Required Materials

TRAVELING IN SPACE REQUIRED MATERIALS FOR THE CLASSROOM

Things to Collect

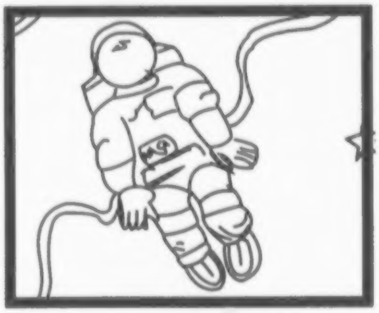
Pictures of various vehicles
Toy cars, trains and boat
Heavy object, light object
Styrofoam meat trays
Nylon parachute, round table cloth or bed sheet
Shopping or tote bags
Small objects, such as space dolls, figurines or thread spools
Lightweight plastic bags
Nylon thread

Supplies

Paper
Crayons, marker, felt-tip pens, colored pencils
Watercolors and brushes
Paper cups
Paper clips, bobby pins or clothespins

Materials and Resources

Space shuttle model
Blocks
Tricycles, wagons, swings
Pictures/models of airplanes and space shuttle
Slide and swing sets
Beach balls or dodge balls
Picture of space shuttle launch
Story on airplanes
"Parachute Play" by Dick and Liz Wilmes



TRAVELING IN SPACE REQUIRED MATERIALS FOR THE FAMILY

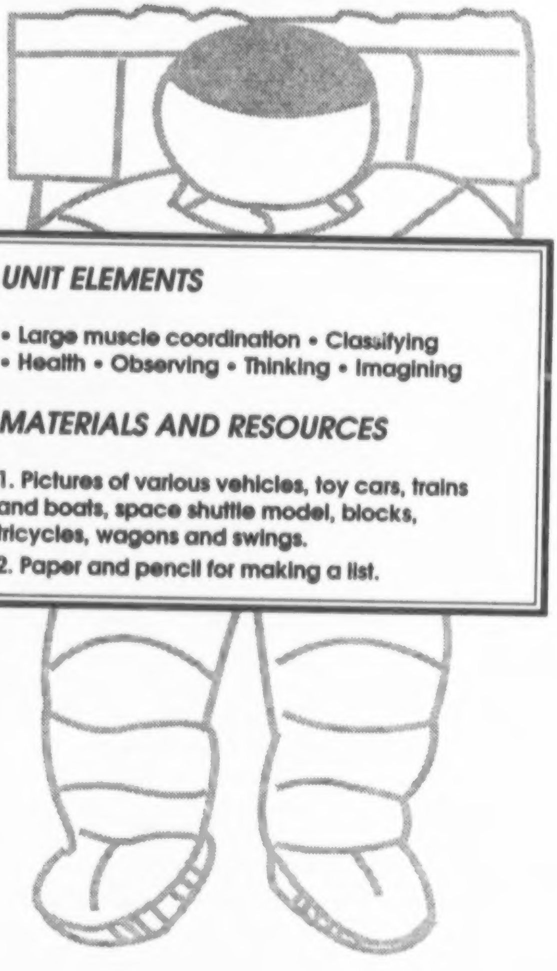
Paper, 3 X 5 cards, glue, straws, tape
Pencil, crayons, colored markers
One heavy object, one light object
Beach balls or dodge balls
Styrofoam meat trays
Paper clips, sand paper or emery board
Drycleaning bag or plastic bg or wrap
Thread, modeling clay or similar weight
Lego astronaut or small screw

Means Of Transportation

DESCRIPTION

This activity focuses children's attention on the many modes of transportation which people use to get them from one place to another. Children discuss leg power which moves some vehicles that they know already. The activity prepares them for the next unit which discusses power and engines as necessary for moving objects and therefore necessary for overcoming the pull of gravity.

Before you begin this unit, display pictures of various vehicles and provide toy cars, trains, boats, airplanes and a model of the space shuttle in the block area. Encourage children to build ramps, garages, highways, marinas, airports and bridges with blocks to use with the transportation toys. Let children also explore and play with tricycles, wagons, climbing equipment and swings before beginning this unit.



UNIT ELEMENTS

• Large muscle coordination • Classifying
• Health • Observing • Thinking • Imagining

MATERIALS AND RESOURCES

1. Pictures of various vehicles, toy cars, trains and boats, space shuttle model, blocks, tricycles, wagons and swings.
2. Paper and pencil for making a list.

ACTIVITY

1. Talk about various ways to get from one place to another. Discuss and list the different means of transportation which children know. Draw attention to pictures, toys and children's vehicles in the classroom to help the discussion.

Discuss walking as a means of transportation. Call attention to the legs as the power which children use to move from one spot to another.

Ask children to name other ways they use leg power to move themselves. Discuss tricycles, wagons and the swing as using leg power.

Take the children outdoors and let them experience leg power. Encourage them to walk, skip, jump, run, swing, ride tricycles and wagons and then discuss their experiences. Which activity made them go fastest and highest? Which tired them the most? Which would help them go some place the quickest? Ask them if they know how to develop strong legs for lots of power. Discuss bones, muscles and the need for nutritious food and exercise. Let children stretch/contract their calf muscles and feel them by sitting on the ground and lifting their legs by the tips of their toes.

2. Take the children for a walk in the neighborhood; ask them to look for various means of transportation in the area. Help them observe cars, motorcycles, bicycles, skateboards, trucks, buses and possibly airplanes, helicopters and trains. Talk about which vehicles they think would get them some place the fastest. Which would be the slowest?

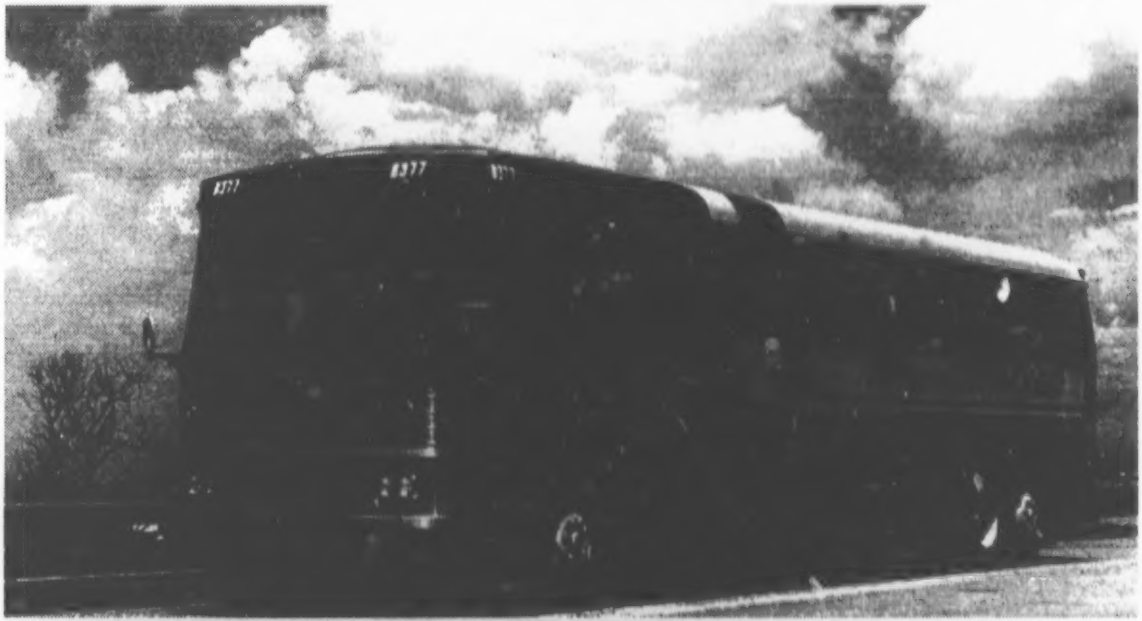
Means Of Transportation

Once in the classroom, add the children's vehicle observations to the list previously started if they are not included already.

3. Ask the children where they think all these vehicles are going. Help them wonder about people traveling to various places. The man on the motorcycle may be going on vacation to the beach. The little girl in the airplane overhead may be visiting her grandmother.

4. Ask the children to choose a vehicle and decide on a place to visit. Help them plan what they should take on their trip and then discuss their selections if they wish. Help the children write a story about the trip by writing down exactly what they say. Read the story back to them and discuss the story.

5. Let the children build their favorite vehicles in the block area and play with them. Talk about their vehicles and what makes them move.



Buses similar to the one pictured here can be seen daily all over the country. (Greyhound Photo)

The shuttle Columbia glides to its first landing at Edwards Air Force Base with a chase plane along side. (NASA Photo)

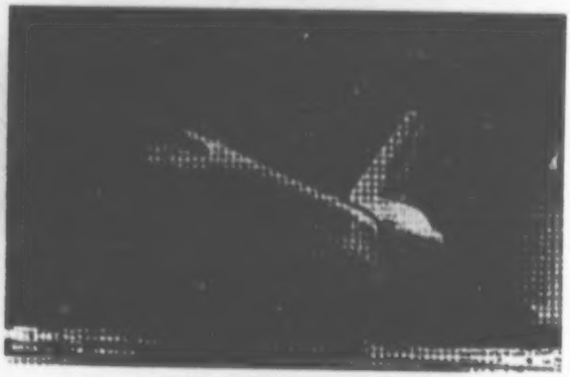
Means Of Transportation

BACKGROUND NOTES

To move on the ground, in the water or through the air, you must apply a force. You can do this by pushing against the ground, pushing water or pushing through air. In space, you move like a bullet. The force you get during launch is most of the force that you have. (You can add small rockets to make slight changes in speed.) The shuttle is given a huge kick into outer space by its boosters and engines. It would continue away from the Earth but gravity warps its path into an orbit.

Trains like this one pictured above move passengers and freight. (AMTRAK Photo)

Two corporate-style jets sit on the Tarmac with an automobile in the foreground. (Gates/Lear Photo)



The shuttle Challenger glides to a landing at Edwards Air Force base. (NASA Photo)

Means Of Transportation

NOTES

Means Of Transportation

The Family Shuttle
NASA
United States

BACKGROUND NOTES

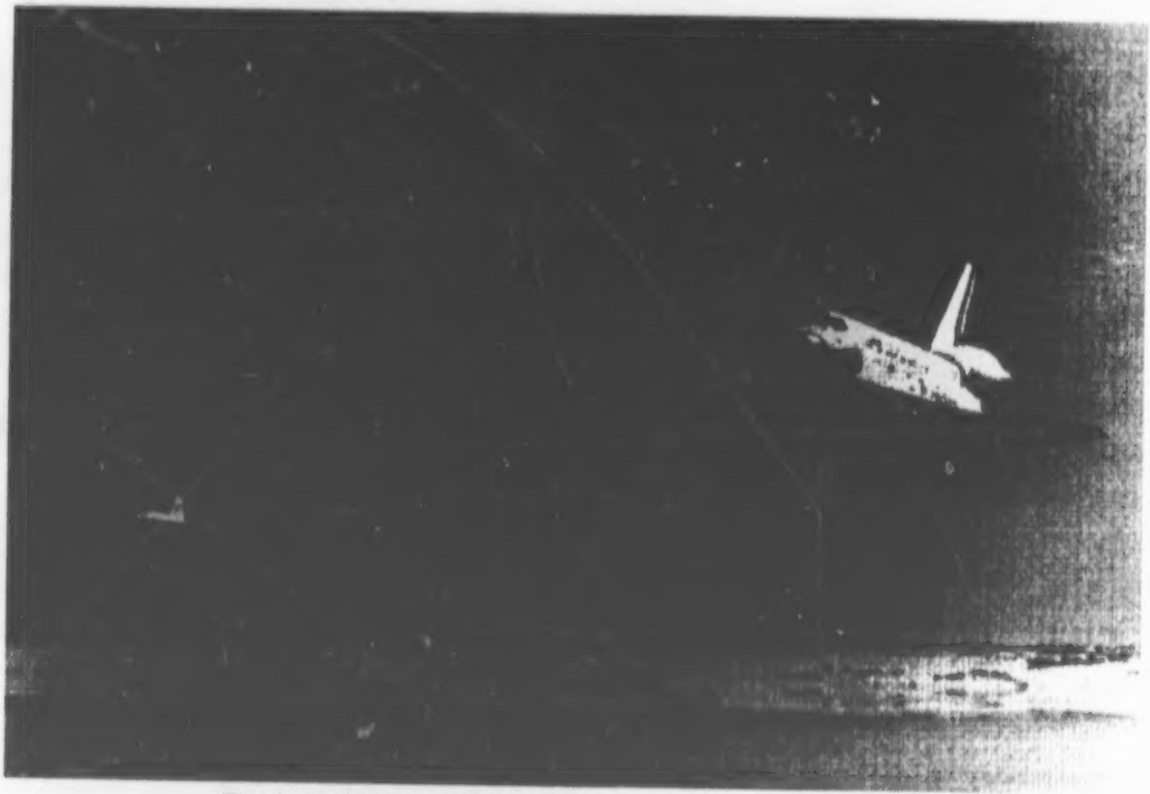
To move on the ground, in the water or through the air, you must apply a force. You can do this by pushing water or pushing through the air. In space, you move like a bullet. The force you get during launch is most of the force you have. (You can add small rockets to make slight changes in speed.) The shuttle is given a huge kick into outer space by its boosters and engines. It would continue away from the Earth but gravity warps its path into an orbit.

MATERIALS NEEDED

Paper, pencil and crayons.

ACTIVITY

Children are learning about various ways of getting from one place to another. In the classroom, they have discussed their arms and legs as a means of transportation and have watched vehicles while they were outside with the teacher.



The shuttle Columbia glides to its first landing at Edwards Air Force Base with a chase plane along side. (NASA Photo)

Means Of Transportation

The next three family activities will help your children start to think about Earth's gravity by showing them that vehicles need power and engines to overcome Earth's pull on them. Eventually, the activities help children learn that vehicles which actually leave the ground, such as airplanes and space shuttles, need very powerful engines to overcome Earth's gravity.

1. Take your family for a walk in the neighborhood. Ask them to look for various means of transportation in the area. Help them observe cars, motorcycles, bicycles, skateboards, trucks, buses and possibly airplanes, helicopters and trains.

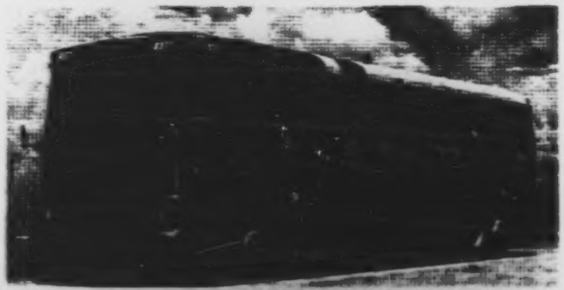
Talk with your children about vehicles they think would get them some place the fastest. Which would be the slowest?

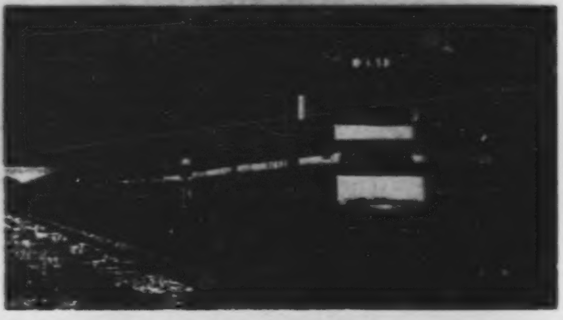
2. Ask them where they think all these vehicles are going. Help them wonder about people going various places. The man on the motorcycle may be going on vacation to the beach, for instance. The little girl in the airplane overhead may be visiting her grandmother.

Buses similar to the one pictured here can be seen daily all over the country. (Greyhound Photo)
Photo to the right.

Trains like the one pictured below move passengers and freight. (AMTRAK Photo)
Photo to the lower right.

Two corporate-style jets sit on the Tarmac with an automobile in the foreground. (Gates/Lear Photo)
Photo below.





Want To Give Your Children More Space To Grow?

Ask your children to choose a vehicle that they have seen to pretend about and decide on a place to visit. Help them decide what they should take on their trip and then discuss their selections.

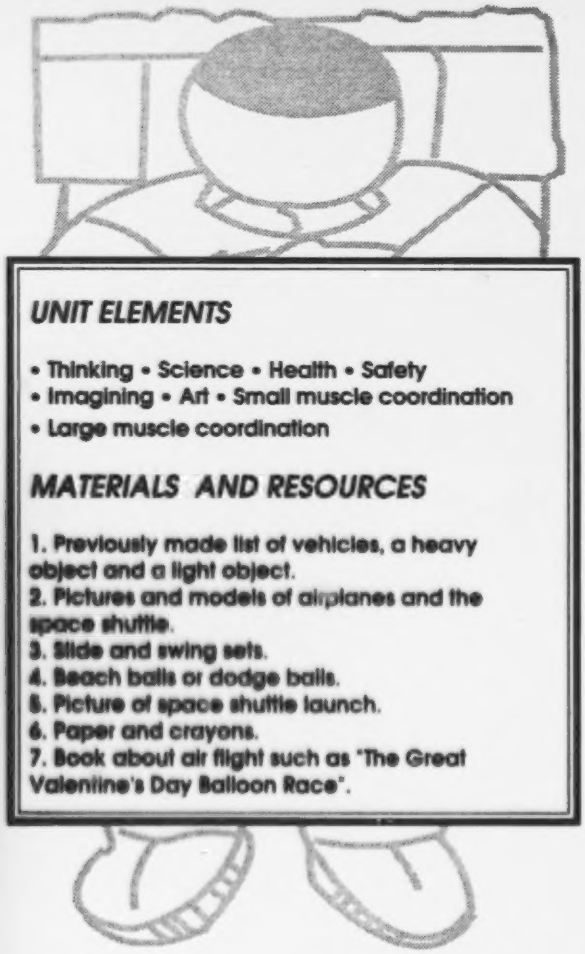
Suggest to your children that together you write a story about their trips. Copy on paper exactly what they tell you and then read it back to them as a story. Let them draw pictures and attach them to their stories.

Gravity

DESCRIPTION

This activity builds upon the previous transportation unit and helps children to think about the power that moves vehicles.

Children are introduced to "gravity" as a word and a concept. Use every opportunity throughout this section to reinforce the idea of "What goes up must come down" to help the children begin to think about the effect of gravity.



UNIT ELEMENTS

- Thinking • Science • Health • Safety
- Imagining • Art • Small muscle coordination
- Large muscle coordination

MATERIALS AND RESOURCES

1. Previously made list of vehicles, a heavy object and a light object.
2. Pictures and models of airplanes and the space shuttle.
3. Slide and swing sets.
4. Beach balls or dodge balls.
5. Picture of space shuttle launch.
6. Paper and crayons.
7. Book about air flight such as "The Great Valentine's Day Balloon Race".

A fully assembled shuttle system is rolled out of the Vehicle Assembly Building. (NASA Photo)

ACTIVITY

1. Show the children their list of vehicles which they previously made. Ask them which ones use leg power. Ask which vehicles used on Earth do not rely upon leg power. Make a separate list of these and ask the children for suggestions as to what makes them move from one place to another. Show pictures to help children remember and think.

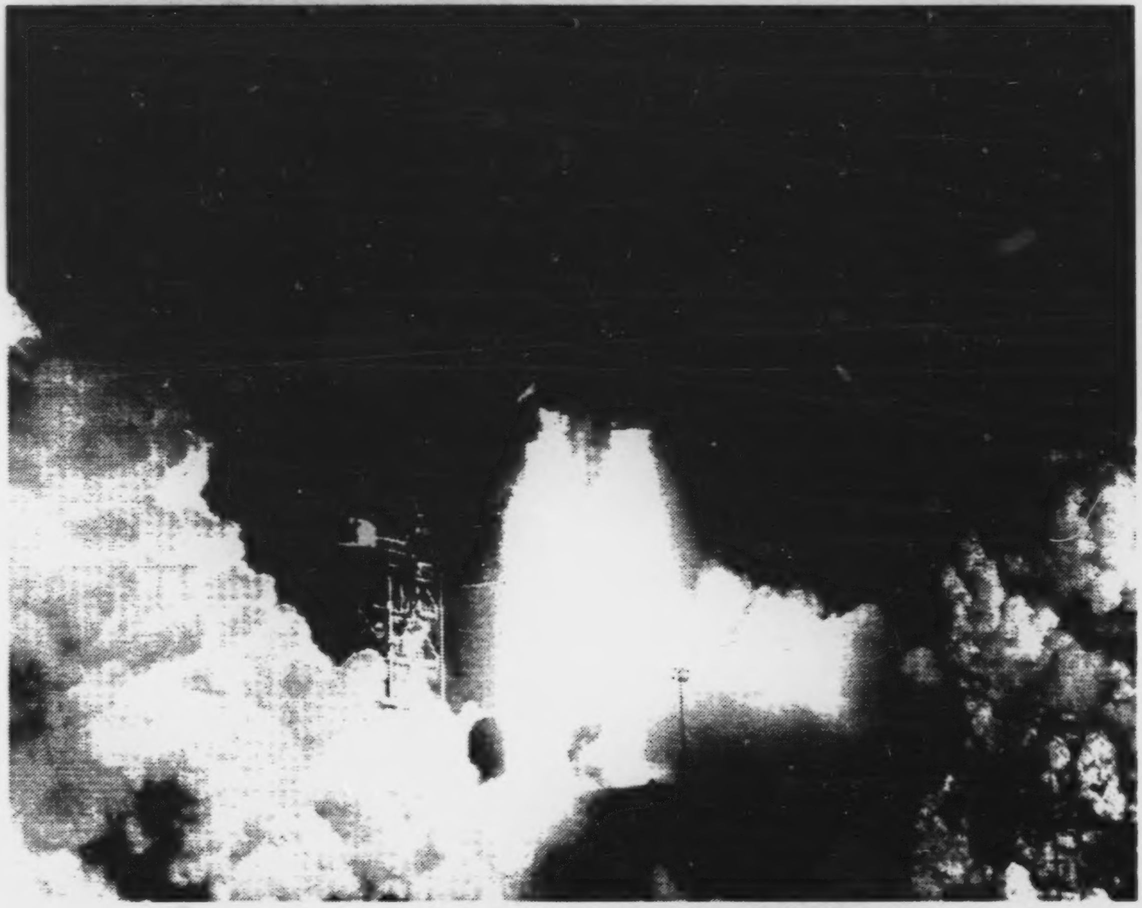
Ask the children why the leg power, which they use to move themselves, would not move a car or a truck or a train. Explain to them, if they do not offer the reason, that engines supply power for cars, vans, trucks and boats, because they are heavier than wagons, tricycles, bicycles and need more of a push to move them.

Ask children to help you prove this by having them push two objects around the classroom floor. Make one object relatively heavy and the other relatively light for them to push. Let them compare and discuss their observations. Suggest two children push the heavier object to see if it will move more easily. Again, talk about their observations. Conclude by telling children that the heavier a vehicle is, the more power its engine has to have.

2. Show the children pictures and models of airplanes and the space shuttle (the orbiter with solid and liquid fuel tanks). Tell the children that manufactured objects which fly in the sky really need powerful, big engines because they leave the ground. Leaving the ground and staying in the air requires a lot of energy, strength and power. Ask the children to help you with an experiment to show this.

Tell the children to jump forward across the room and then repeat the activity by walking across the room. Discuss which took more energy and power for them to do. Suggest jumping took more energy because they were leaving Earth for a little bit each time they jumped.

Explain that is it hard to leave Earth for any length of time because there is something called



Columbia leaves launch complex 39A and heads upward against the forces of gravity, encountering the greatest forces in the first few miles. (NASA Photo) gravity which pulls us to Earth and keeps us on the ground. Let children repeat the word and write it for them to see. Explain that gravity means what goes up in the air must come down to Earth.

3. Ask the children to use leg power to take them off the ground and watch gravity pull them back to Earth. Take them to the playground and explain that they are going to use the slide and swing sets to leave Earth on a small journey, and then come back because gravity is pulling them to Earth. Or provide a sturdy, low box on which they can climb and jump "down." Remind children as they swing "up" and climb "up" the slide ladder that they are using leg power to get away from the pull of gravity. When children swing and slide "down," explain to them that they are experiencing the Earth's pull or gravity. Ask the children to tell you when they are leaving and returning to Earth as they swing and slide.

4. Some children may want to use arm power and have a big ball leave Earth for a little journey and then come back because of gravity's pull. Supply beach balls or dodge balls and let children "launch" them. Let them practice a few times and try to get their balls higher and higher in the sky by pushing harder and harder. Reinforce the idea that "What goes up must come down" whenever it is appropriate.

5. Show the children a picture of a space shuttle launch and ask them if they think a big or little engine is needed to push the orbiter away from Earth. (Do not confuse the fuel tanks and en-

Astronauts in training get a taste of weightlessness for brief periods of time in a specially modified aircraft. (NASA Photo) gines on the space shuttle. The liquid fuel tank is much larger than the orbiter itself, for instance, and lends itself to an easy comparison to dramatize the power needed to launch a spacecraft, but it is not an engine. It feeds fuel to the orbiter's engines. The two solid fuel rocket boosters which ride on either side of the orbiter, however, are engines.) Tell the children the orbiter is so big and so heavy and needs to go higher in the sky than they can see, that it needs more power than anything else that flies in the sky to overcome the Earth's gravitational pull.

6. Supply paper and crayons and let the children create their own version of a spacecraft leaving Earth. Hang their work at eye level so they may look at it and talk about the pictures with each other.

7. Read a developmentally adapted version of a book about air flight and energy, such as Adrienne Adams' "The Great Valentine's Day Balloon Race."

BACKGROUND NOTES

Gravity can be described as the atoms or material in your body pulling on the materials in the Earth. Gravity is what keeps the planets in orbit around the Sun. It also keeps the Sun spinning in the galactic pinwheel of two hundred billion suns that we call the Milky Way.
Gravity is such a familiar part of life that you tend to forget it. Sitting up in bed, you do not blame gravity, you talk about how hard it is to get up. There is no way to escape gravity on Earth. To get a little idea of what it is like not to have gravity you could float underwater or get into an airplane and have it perform dives. That "falling" feeling is what it feels like in outer space.

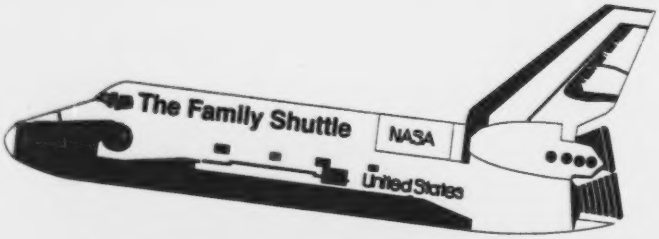
When astronauts orbit the Earth, they are still in the Earth's gravity. But an orbit is like falling all the way around the Earth, so it feels like there is no gravity. This is called micro-gravity or zero-gravity. The floating can be fun, but there is a period of adjustment during which the astronauts can become a bit disoriented and dizzy.

Your body changes when there is little or no gravity pulling on it. Muscles which do not have to work hard, get weaker. Bones in your body lose calcium. There are changes in your blood. In fact, people might have to make "artificial gravity" by spinning a spacecraft to keep changes like these from getting too severe.

All of these changes make space flight fun, but very challenging. Working without gravity is the biggest change astronauts have.

NOTES

Gravity



BACKGROUND NOTES

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Gravity is such a familiar part of life that you tend to forget it. Sitting up in bed, we do not blame gravity, you talk about how hard it is to get up. There is no way to escape gravity on Earth. To get a little idea of what it is like not to have gravity, you could float underwater or get into an airplane and have it perform dives. That "falling" feeling is what it feels like in outer

Astronauts in training get a taste of weightlessness for brief periods of time in a specially modified aircraft. (NASA Photo) space.

When astronauts orbit the Earth, they are still in Earth's gravity. But an orbit is like falling all the way around the Earth, so it feels like there is no gravity. This is called micro-gravity or zero-gravity. The floating can be fun, but there is a period of adjustment during which the astronauts can become a bit disoriented and dizzy. Your body changes when there is little or no gravity pulling on it. Muscles which do not have to work hard, get weaker. Bones in your body lose calcium. There are changes in your blood. In fact, people might have to make "artificial gravity" by spinning a spacecraft to keep changes like these from getting too severe.

Columbia leaves launch complex 39A and heads upward against the forces of gravity, encountering the greatest forces in the first few miles. (NASA Photo)

Gravity

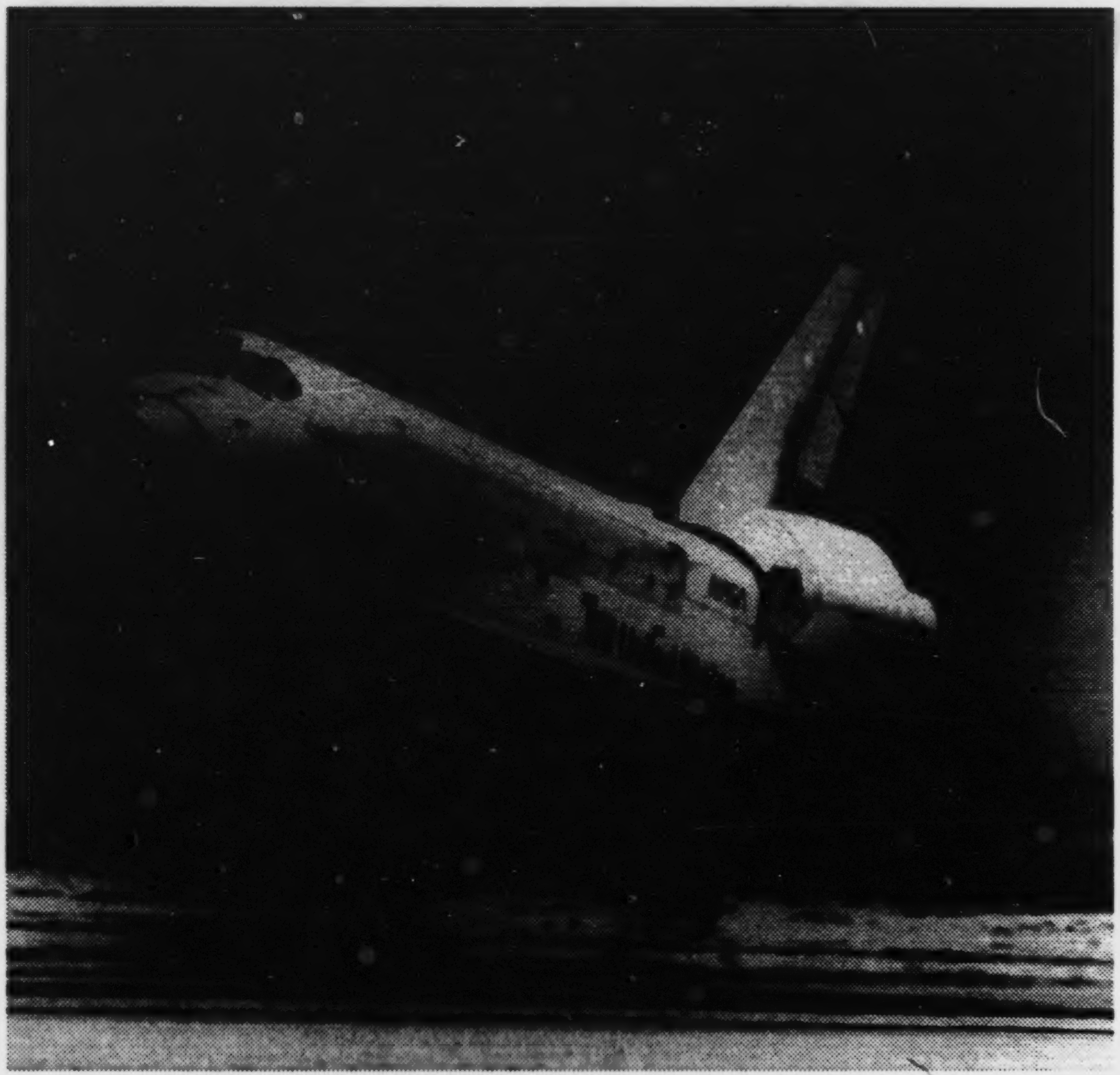
All of these changes make space flight fun, but very challenging. Working without gravity is the biggest change astronauts have.

MATERIALS NEEDED

One heavy object, one light object and beach balls or dodge balls.

ACTIVITY

Children are being introduced to gravity as a word and a concept in school. However, gravity is too difficult for preschool children to understand. Your children may know the word, but the concept behind it is too advanced for them.



The shuttle Challenger glides to a successful landing at Edwards Air Force Base after the conclusion of a Spacelab 2 mission. (NASA Photo)

Gravity

This family activity is valuable because it begins to build your children's awareness of gravity as a foundation for later concept development. Use every opportunity throughout the activities to reinforce the idea of "What goes up in the air must come down to Earth again" to help children begin to think about the effect of gravity.

1. Ask your children why leg power, which they use to move themselves, would not move a car, truck or train. Ask them if they know what moves any of the vehicles which they have seen during walks outdoors. Explain to them that engines supply power for cars, vans, trucks and boats because they are heavier than wagons, tricycles and bicycles, and need more push or power to move. Ask children to help you prove this by having them push two objects around the floor. Make one object relatively heavy and the other relatively light for them to push. Compare and discuss their observations. Tell them that the heavier a vehicle is, the more push or power its engine must have.

2. Ask your children to jump forward across the room and then repeat the activity by walking across the room. Discuss which took more energy and power for them to do. Tell them jumping took more energy because they were leaving Earth for a little bit each time they jumped.

Explain that is it hard to leave Earth for any length of time because there is something called "gravity" which pulls us to Earth and keeps us on the ground. Let your children repeat the word. Tell them that gravity means "What goes up in the air must come down to Earth again." Discuss with them vehicles which leave Earth, such as airplanes, helicopters and spacecraft. Let them know that these vehicles need very powerful pushes or engines to get them off the ground to overcome gravity's pull.

Want To Give Your Children More Space To Grow?

1. Ask your children if they want to use leg power to take them off the ground and watch gravity pull them back to Earth.

Take them to a neighborhood playground and explain that they are going to use the slide and swing sets to leave Earth on a small journey and then come back because gravity is pulling them to Earth.

Remind your children as they swing "up" and climb "up" the slide ladder that they are using leg power to get away from the pull of gravity. When children swing and slide "down," explain to them that they are experiencing the Earth's pull or gravity.

Ask your children to tell you when they are leaving and returning to Earth as they swing and slide.

2. Your children may want to use arm power and have a big ball leave Earth for a little journey and then come back because of gravity's pull. Give them beach balls or dodge balls and let them "launch" the balls by pushing them into the air with their arms. Let them practice a few times and try to get their balls higher and higher in the sky by pushing harder and harder as they release the balls. Discuss the activity with your children. Reinforce the idea that "What goes up must come down."

Atmospheric Flight

DESCRIPTION

These activities progress from an earlier unit on "Traveling in Space" and involve gravity and the effect air has on gliders, helicopters and parachutes. Gravity is discussed as a background note in the "Traveling In Space" Unit 2, and weightlessness is explained at the beginning of the "Traveling in Space" section of the curriculum module. Preschool children will not understand the concepts of gravity and weightlessness, but the words and a description will help set the stage for later concept formation. It is not necessary for this unit to make the distinction between a glider and an airplane for the children. A glider needs to be towed in the sky by an aircraft with an engine in order to float back to Earth. Space shuttle orbiters are themselves gliders and need rocket engines to propel them through Earth's atmosphere and into space.

GLIDERS

Before you begin this unit, explain to parents that these activities require extra adult hands to help develop the resources necessary for the activities. Ask additional parents to volunteer to help in the classroom.

1. Read the children a story about airplanes. Talk about the plane taking off, flying and landing. Ask the children if they remember what makes an airplane leave the Earth. Discuss engines and power with them. Discuss what

UNITELEMENTS

• Small muscle coordination • Symbol recognition• Science • Imagining • Nature studies • Observing

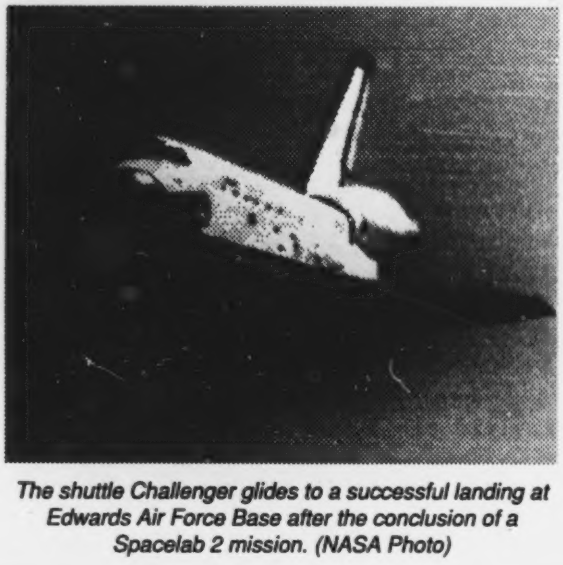
MATERIALS AND RESOURCES

1. Story about airplanes.
2. Glider plane pieces cut from Styrofoam meat trays, glue, plastic, straw, strips of paper and paper clips.
3. Model or picture of a helicopter, paper helicopters, papers clips or bobby pins and colored markers.
4. Paper cups.
5. Nylon parachute or round tablecloth or bed sheet and "Parachute Play" by Dick and Liz Wilmes.
6. Department store bags, tote bags or shopping bags.
7. Dry cleaning bags, plastic bag or wrap, nylon thread and tape.
8. Small objects such as dolls, figurines, thread spools or clothespins.
9. Paper, crayons, felt-tip pens, colored pencils, watercolors and brushes.

Example of a light weight glider. (Unkown Photographer) brings an aircraft down to the ground again. Talk with them about the Earth's pull and gravity. Remind them that everything that goes up in the air must come down!

2. Present the children with glider plane pieces which previously have been cut from Styrofoam meat trays by you and your parent volunteers. Be sure to fasten a light weight, such as a paper clip or a bobby pin, at the nose of the glider. Use the template following this section as a model for making the gliders. Let the children be as much a part of the construction as possible. They may be able to slide the wings of the glider through the fuselage, for example.

Ask the children if they want to see if Earth's pull will bring gliders down to the ground. Let them decorate and perhaps name their gliders. Take the children outside with their gliders. Tell them to use hand power to push the gliders into the air and observe how they soar and are pulled to the ground by gravity. Let the children play with the gliders and discuss their observations. Hang the gliders in the classroom as you would hang a Christmas tree ornament by punching a small hole at the top of the fuselage. This allows children to admire as well as play with the gliders.



The shuttle Challenger glides to a successful landing at Edwards Air Force Base after the conclusion of a Spacelab 2 mission. (NASA Photo)

HELICOPTERS

Helicopters provide the opportunity to discuss another form of aviation transportation, to talk about engines and power that are needed to lift the aircraft in the air and to let children experience how gravity's pull can be slowed through rotor motion.

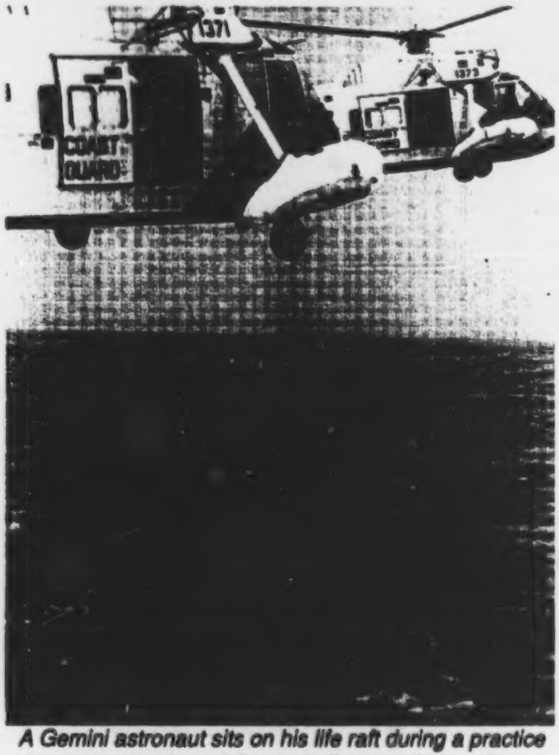
1. Show the children a model or picture of a helicopter. Ask if anyone knows what it is. Tell them that a helicopter is an airplane with moveable wings. Point out the rotors of the helicopter and explain that they keep the plane in the air by twirling around. Demonstrate with a paper helicopter how helicopters work . Ask the children for their reactions. Point out that it is pulled to the ground more slowly than the gliders with which they played.

2. Ask them if they want to watch how gravity pulls paper helicopters to the ground. With the assistance of classroom volunteers, give children weighted paper helicopters made from the template following this section. Children should participate in making them as much as possible. Using different colored markers to indicate a cut line and a fold line may permit older children to make helicopters by themselves.

3. Let the children play with their helicopters. Take them out to the playground and let them release helicopters from a safe, high place, such as a jungle gym. Talk about what the children observe. Suggest that the rotors slow the Earth's pull on the helicopter.

4. In the classroom, ask the children to pretend to be helicopters. Let them lift their arms to their sides and slowly twirl their bodies around in circles like rotors of a helicopter. Tell them that rotors start very slowly and then go faster and faster as they lift the helicopter from Earth. Ask the children to make a slow, soft landing as gravity pulls them back to Earth when they finish their short trip. Make sure to stop the twirling before the children get dizzy.

Atmospheric Flight



A Gemini astronaut sits on his life raft during a practice recovery exercise, while two helicopters hover above. (NASA Photo)

5. Make another kind of helicopter for children to use. Take a paper cup and make six or seven cuts down the sides to about one inch above the bottom. Bend the resulting strips outward for rotors. Toss the helicopter the same way that you throw a frisbee.

6. If the activity is done where and when maple trees shed their helicopter-like seeds, encourage children to play with and observe the seeds and compare them to paper helicopters.

PARACHUTES

These activities will show children that parachutes slow down moving objects. Parachutes were used to slow the descent of Mercury, Gemini and Apollo spacecraft before the space shuttle program began. As these spacecraft left their outer space orbit and re-entered Earth's atmosphere, they were traveling at enormous speeds. Without parachutes, the free-falling spacecraft would have crashed disastrously into the ocean.

Since the space shuttle's orbiter is a glider, the shuttle's underbelly is used to slow its atmospheric descent. By raising its nose up while being pulled to Earth, the shuttle presents the largest possible shield to act as a parachute. The huge orbiter descends so fast that special ceramic heat tiles were designed to prevent it from burning up as it gains momentum during reentry.

1. Discuss with the children the rotors of a helicopter and how they slow the Earth's pull on the helicopter. Tell the children you know another way to slow gravity's pull. Show them a picture of a parachute and let them practice the word. Explain to them that wind rushes into the opened parachute and that the parachute slows anything being pulled down to Earth.

2. Show the children a commercially available, nylon, play parachute and a small round tablecloth or a bed sheet. Ask if they want to experiment with their (pretend) parachute on the playground to see how it slows down things.

Let children play group games outside to experience the air's effect on parachutes. "Parachute Play," by Dick and Liz Wilmes, is a resource book which suggests many activities for this. After free play, discuss their observations about the parachute.

3. On the playground, let two children hold the handles of a shopping or tote bag while running. The air rushing into the bag will slow the children's ability to run as fast as they normally could. After everyone has tried it, ask children to share their experience.

4. In the classroom, show children a doll or figurine. Hold the doll or figurine above your head and then drop it to the floor. Ask children if they know why the figure fell to the floor. Suggest it was gravity. Discuss any ways children know to slow down gravity's pull. Remind them of the helicopter's rotors.

5. Show them a parachute that you and parent volunteers made from the template following this section.

Attach the parachute to the figure and ask children for their predictions about the effect the parachute will have on the falling figure.

6. Provide children with small objects, such as dolls, figurines or thread spools. Let children hold objects above their heads and then drop them. Ask them if they know what made the object drop that fast to the floor. Give each child a parachute. Let the children be as much a part of the project assembly as possible. Ask them if they want to experiment to see how a small parachute will slow down the Earth's pull on the object.

Let children hold parachutes with attached objects above their heads and drop them. Encourage them to play for a while and then discuss what they observed.

A parachutist glides to a soft landing.
(NASA Photo)

7. Ask children to pretend they are floating down to Earth by a parachute. Provide paper, crayons, felt-tip pens, colored pencils and watercolors and brushes, and ask them to draw what they imagine as they are pulled slowly to Earth by gravity. Ask them what they think the tops of trees and houses look like. Ask them to think what it would feel like to pass through a cloud on their way down to Earth. Is a cloud warm or cold? Do they get wet from a rain cloud as they pass through?

Ask the children to tell you about their artwork. Write what they say about their pictures on a small pad of paper and then tape each child's comments on the back of the picture before the artwork is sent home to the family.

BACKGROUND NOTES

The difference between moving in space and moving in the atmosphere is the medium of air. Air acts like a fluid flowing around and slowing down anything that tries to move through it. When the shuttle returns from space, it is a glider and must float through the air. Earlier spacecraft like Mercury, Gemini and Apollo fell back into the atmosphere and were slowed by parachutes.

Atmospheric Flight

Apollo 17 floats to a gentle landing in the Pacific Ocean. (NASA Photo)

NOTES

Atmospheric Flight

The Family Shuttle
NASA
United States

BACKGROUND NOTES

The difference between moving in space and moving in the atmosphere is the medium of air. Air acts like a fluid flowing around and slowing down anything that tries to move through it. When the shuttle returns from space, it is a glider and must fly through the air. Earlier spacecraft like Mercury, Gemini and Apollo fell back into the atmosphere and were slowed by parachutes.

ACTIVITY

Children are experimenting with gliders, helicopters and parachutes in the classroom to see how they are pulled back to Earth by gravity. These activities will help you to duplicate some of the classroom units.

Encourage your family to have fun as they make and experiment with the various activities. Use every opportunity to help your children understand that what goes up in the air must come down to Earth.

GLIDERS

It is not necessary to make the distinction between a glider and an airplane for your children. A glider needs to be towed in the sky by an aircraft with an engine in order to float back to Earth. Space shuttle orbiters are themselves gliders and need rocket engines to propel them through Earth's atmosphere and into space.

1. Ask your children if they want to experiment to see if Earth will pull gliders down to the ground. Cut glider plane piece from Styrofoam meat trays. Be sure to fasten a light weight paper clip at the nose of the glider. Use the accompanying template as a model for making the gliders. Let your children help as much as possible. They may be able to slide the wings of the glider through the fuselage, for example. Let them decorate and name their gliders.

2. Take your children outside and ask them to use hand power to push the gliders into the air and watch how they soar and are pulled to the

Example of a light weight glider. (Unkown Photographer) ground by gravity. Let them play with the gliders. Ask them what made the gliders come back to Earth.

3. Experiment and make different gliders from paper with your family. Keep some of the gliders so your children may play with them.

HELICOPTERS

Helicopters give you the opportunity to talk about another form of aviation transportation with your children. Talk about engines and power that are needed to lift the copter in the air. The main objective of this activity, however, is to show your children how gravity's pull can be slowed down through rotor motion.

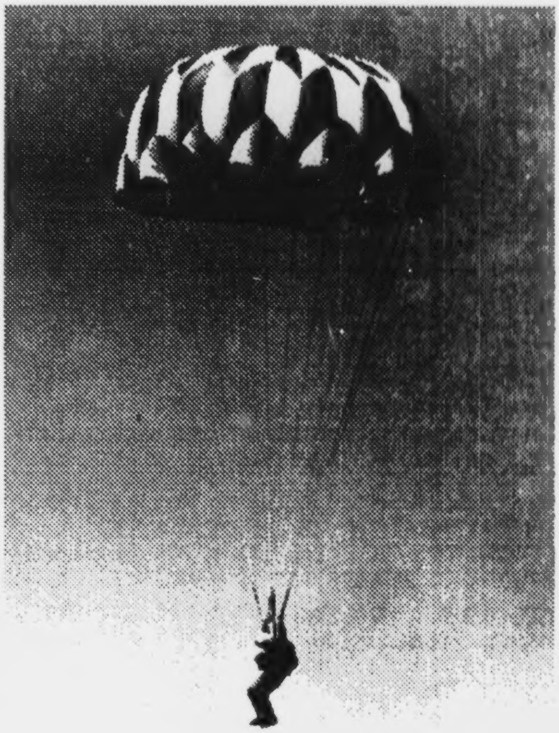
1. Make paper helicopters from the pattern below. Ask your children if they want to hold and drop paper helicopters to watch how gravity pulls them to the ground. The children should make as much of the helicopter as they can. Perhaps they can cut and fold the rotor blades of their helicopters if you use different colored markers to indicate where to cut and where to fold.

2. Let them play with their helicopters. Take the children outside and let them release helicopters from a safe, high place, such as a jungle gym or slide at the park. Tell them that the rotors slow the Earth's pull on the helicopter.

PARACHUTES

Parachutes were used to slow the descent of Mercury, Gemini and Apollo spacecrafts before the space shuttle program began. As these spacecraft left their outer space orbit and re-entered Earth's atmosphere, they were traveling at enormous speeds. Without parachutes, the free falling capsules would have crashed disastrously into the ocean.

1. Talk about the rotors of a helicopter and how they slow the Earth's pull on the helicopter. Tell your children you know another way to slow Earth's pull. Show them a parachute that you made from the template and instructions following this section. Explain to them that wind rushes into the opened parachute and that the parachute slows anything being pulled down to Earth.



Above
A parachutist glides to a soft landing.
(NASA Photo)

Right
A Gemini astronaut sits on his life raft during a practice recovery exercise, while two helicopters hover above.
(NASA Photo)

Atmospheric Flight

1371
COAST
GUARD
1373
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GUARD

Atmospheric Flight

2. Give your children small objects, such as clothespins, dolls, figurines or thread spools. Let them hold objects above their head and then drop them. Ask them if they know what made the object drop to the ground that fast. Give children a parachute. Ask them if they want to experiment to see how a small parachute will slow down the Earth's pull on their objects. Attach the parachute to the small objects and ask your children for their predictions about the effect the parachute will have on the falling object. Let them hold parachutes with attached objects above their heads and drop them. Encourage your children to play for a while and then discuss what they observed.

MATERIALS NEEDED

Styrofoam meat trays, paperclips, paper, colored markers, small objects such as dolls, figurines, clothespins or thread spools, plastic dry cleaning bags, plastic bags or wrap, thread and tape.

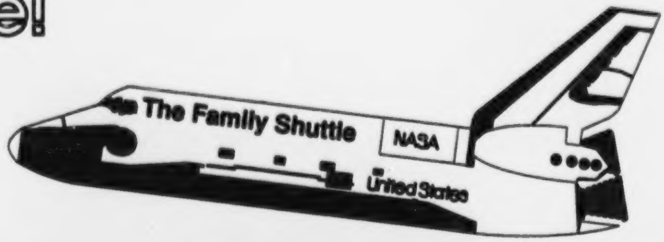
Want To Give Your Children More Space To Grow?

GLIDERS—Read your children a story about airplanes. Discuss planes taking off, flying and landing. Ask them if they remember what makes an airplane leave Earth. Discuss engines and power.

HELICOPTERS—Make another kind of helicopter with your children. Take a paper cup and make six or seven cuts down the sides to about one inch above the bottom. Bend the resulting strips outward for rotors. Toss the helicopter the same way that you throw a frisbee.

PARACHUTES—Let two family members hold the handles of a department store bag or tote bag while running. The air rushing into the bag will affect their ability to run as fast as they normally could. Ask them to share their experience with the rest of the family.

Make Me!



BUILDING GLIDERS AT HOME

Have your children observe the lifting effect of simple wings. The shapes of these two different gliders are different, but they both demonstrate how directing the flow of air with edges and folds causes each to behave the way they do. Ask your children if they think the different shapes of the gliders makes a difference in how they fly.

MATERIALS NEEDED

To make these paper gliders you will need notebook paper, scissors and paper clips.

DIRECTIONS

Glider A.

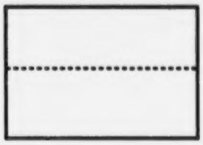
This is a simple glider made from a single 8.5 by 11 inch sheet of paper.

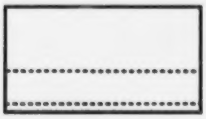
1. Start by folding the paper in half the long way, then open flat and fold one half in half, then what is left in half. Fold once more this way, then make a fifth fold on the original fold.

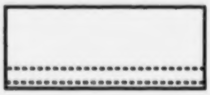
2. Bend the trailing edge up slightly then bend the center to give a "V" shape, called "dihedral," to the glider. (Figure 1)

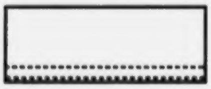
Dihedral is supposed to make an airplane stable but when you fly it this way and it starts to turn, you will find out why it is called a "spinner."

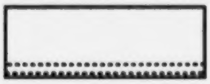
3. Re-fold as shown in Figure 2 to have a stable

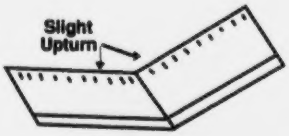

Fold 1


Fold 2

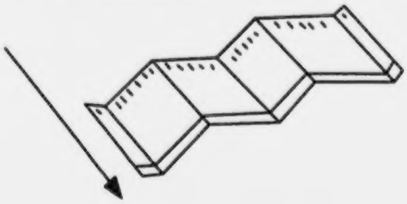

Fold 3


Fold 4


Fold 5



Unstable Form



glider.

Glider B.

This is a simple glider made from paper, paper clips and a straw.

Use a plastic straw, two 1 x 6 inch strips of paper and two paper clips.

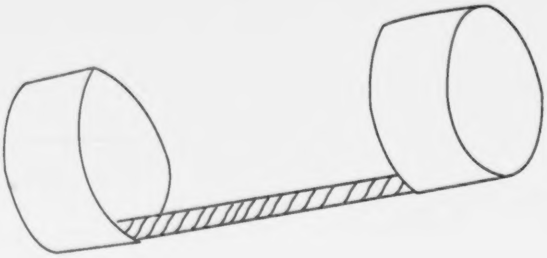


Figure 1

1. Make the strips into circles and clip one circle onto each end of the straw.

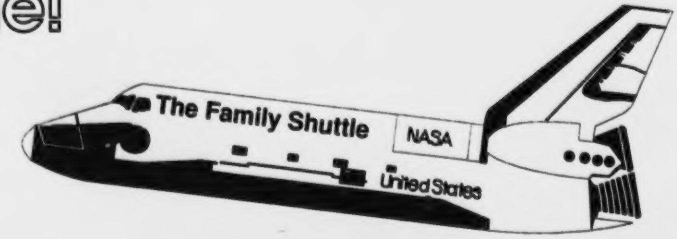
2. Hold so that circles are above the straw.

3. Aim and release.

The directions for this project are provided courtesy of NASA Aerospace Education Services

A shuttle glides in for a landing. (NASA Photo)

Make Me!



BUILDING A SPACE SHUTTLE GLIDER AT HOME

Have your children observe the lifting effect of simple wings. This glider has a rigid form and is made of Styroform. The cut-out pattern follows the lines of the space shuttle. Have your children name their shuttle.

MATERIALS NEEDED

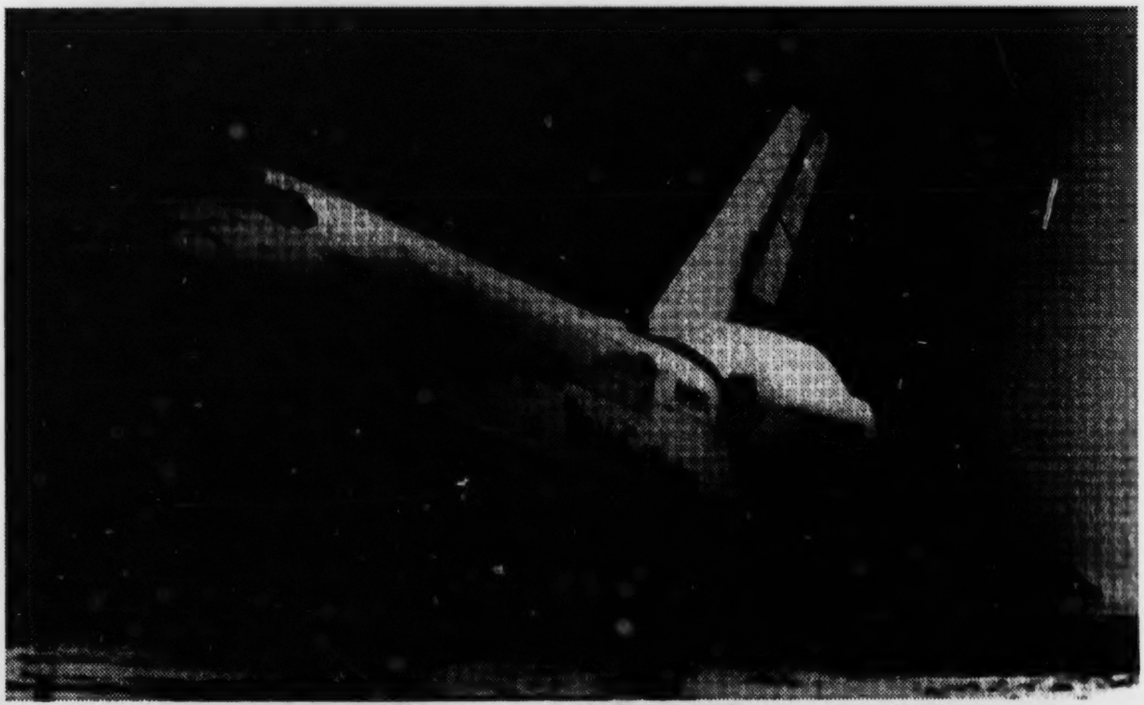
To make this Styrofoam glider you will need flat, thin, Styrofoam (the bottom of a meat tray will work well), scissors or other tool to cut Styrofoam, a felt pen, paper clips, modeling clay or similar weight.

DIRECTIONS

1. Fashion parts from Styrofoam trays. Glue body segments together with white glue or Styrofoam glue. When dry, smooth and round the edges with sandpaper or an emery board. Cut the wing slot with a sharp knife. Use an emery board to open the slot sufficiently to just allow the wing to fit snugly.

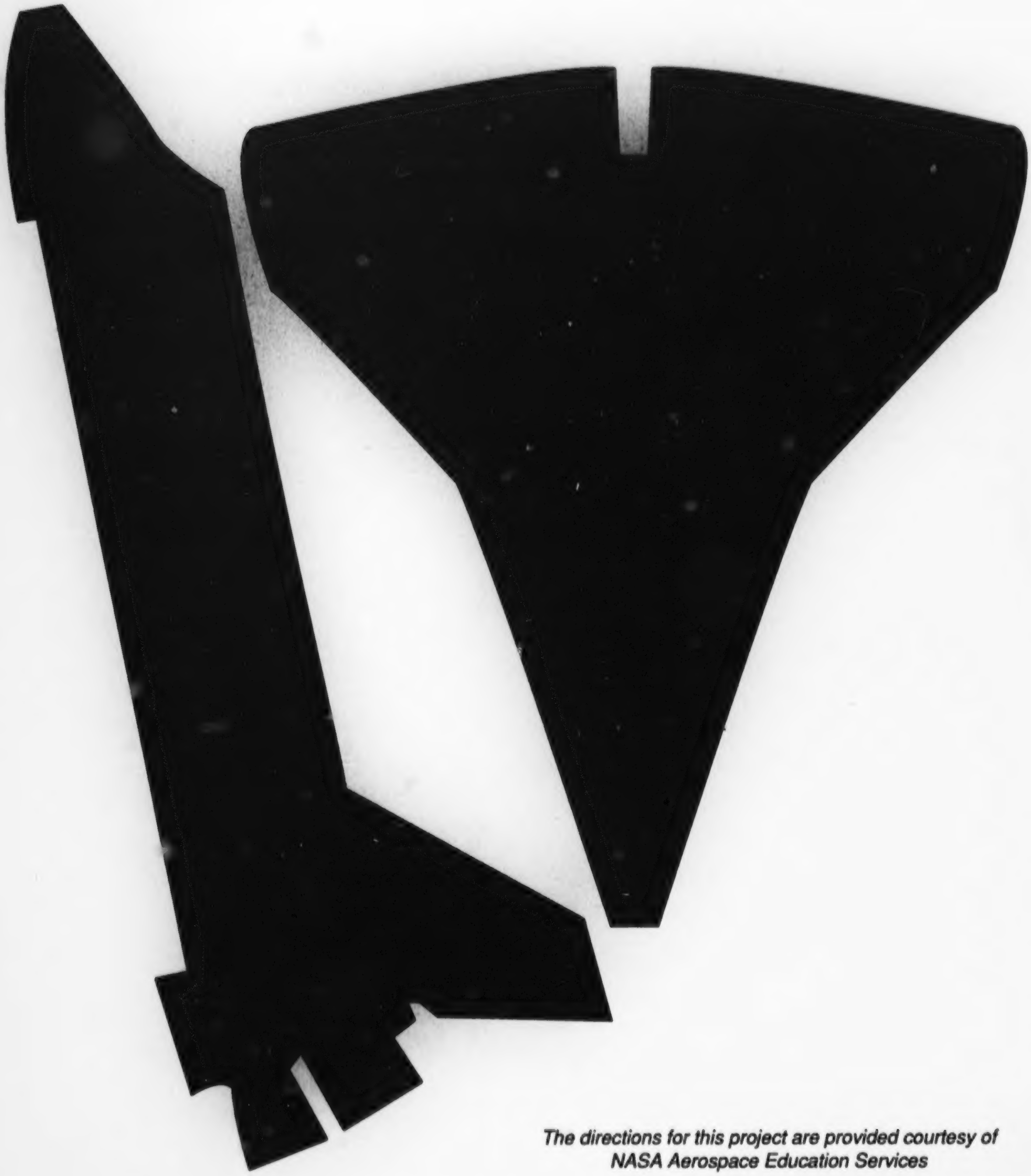
2. Use sandpaper or an emery board to smooth and round the edges of the wing.

3. Make final adjustments after assembly to ensure a straight, level flight. A nose weight fashioned from modeling clay, paper clips, pins, etc. may be necessary.



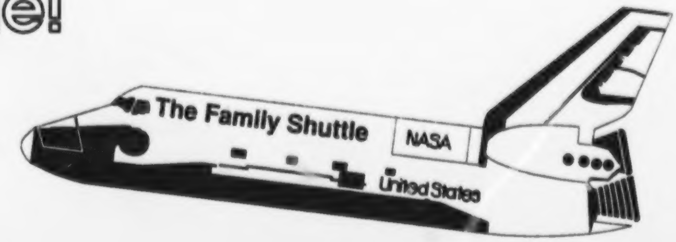
A shuttle glides in for a landing. (NASA Photo)

Make Me!



The directions for this project are provided courtesy of NASA Aerospace Education Services

Make Me!



BUILDING A HELICOPTER AT HOME

Have your children observe the lifting effect of helicopter rotor blades, which provide the helicopter with lift, the force against the atmosphere (the air) which allows them to fly. Demonstrate this by building one or both of the following paper helicopters.

MATERIALS NEEDED

To make these paper helicopters you will need notebook paper, 3 x 5 inch file cards, scissors and paper clips.

DIRECTIONS

Helicopter A.

1. Cut out a strip of paper 8 x 2 inches (the bottom two inches of a piece of notebook paper works perfectly). Make a cut down the center from the top, 4 1/2 inches long, and from each side at a point 3 inches from the bottom, 2/3 of an inch long.

2. Fold the left bottom panel evenly over the middle.

3. Fold the right bottom panel evenly over the left.

4. Attach a paper clip to the bottom.

5. Fold the left top strip forward, the right top strip backward. These are the rotors.

6. Holding the helicopter high above your head, release it. Its spinning flight downward illustrates "autorotation," a method of emergency descent for helicopters if the engine should lose power or if it were to fail.

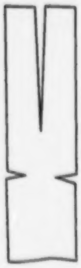


Figure 1

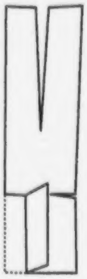


Figure 2

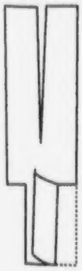


Figure 3

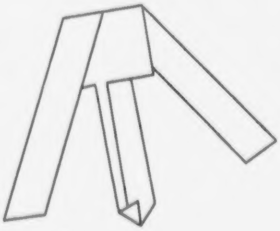


Figure 5

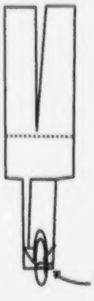


Figure 4

Make Me!

Helicopter B.

Make a model helicopter from a file card by cutting the card on the solid lines and folding it along the dotted lines, shown in the diagram. Fasten the folded section with a paper clip and bend the blades in opposite directions. As this model falls, it illustrates how the spin of the rotor blades of the helicopter can provide lift. (The amount of lift in this model is not sufficient to overcome gravity, but it does slow the fall of the card.)

The directions for this project are provided courtesy of NASA Aerospace Education Services

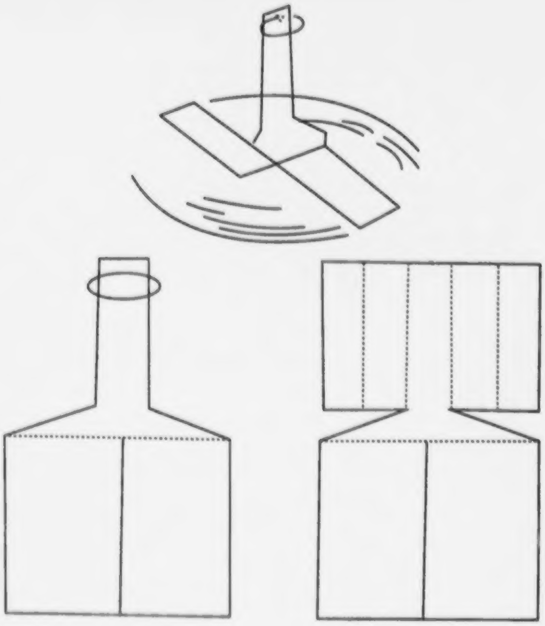


Figure 2

1371
COAST
GUARD
1373
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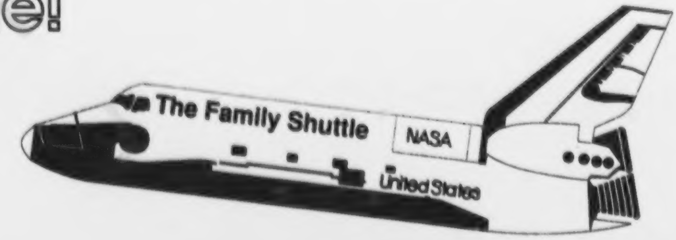
GUARD

Two Coast Guard rescue helicopers hover in the recovery area of an early Gemini practice exercise. (NASA Photo)

Make Me!



BUILDING A PARACHUTE AT HOME

Have your children experience the lifting effect of parachutes in both a large and small way. The large way: If your children can run down a hill holding a coat or towel out over their heads, they will feel how cloth against wind lifts them up. This will help you children experience parachutes with their whole body. The small way is to make a toy parachute.

MATERIALS NEEDED

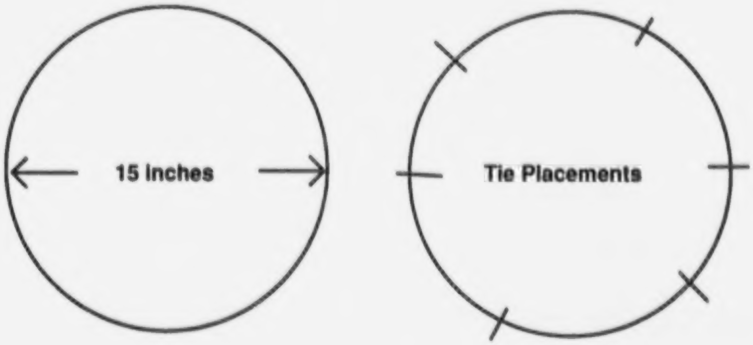
To make the parachute, you need a dry cleaning bag or other very lightweight plastic, nylon sewing thread or light string, scotch tape and a small object such as a Lego astronaut or small screw.

DIRECTIONS

1. Cut a circle 15 inches in diameter from a dry cleaning bag or other lightweight plastic.

2. Fold circle in half and then in thirds. Mark each corner so that when you unfold it, you have six (6) marks equally spaced around the circle. Attach nylon thread with tape to each mark. Thread should be at least 12 inches long. Hold the corners of the parachute together. Pull the free ends of the threads together, making sure they are the same length.

3. Tie the free ends together with a single-over knot. Tie parachute to the Lego astronaut or other small object.



Use a large piece of paper and draw a circle 15 inches in diameter on it. Then use this drawing as a template.

Make Me!

A parachutist glides gently to a landing on the Earth.
(NASA Photo)

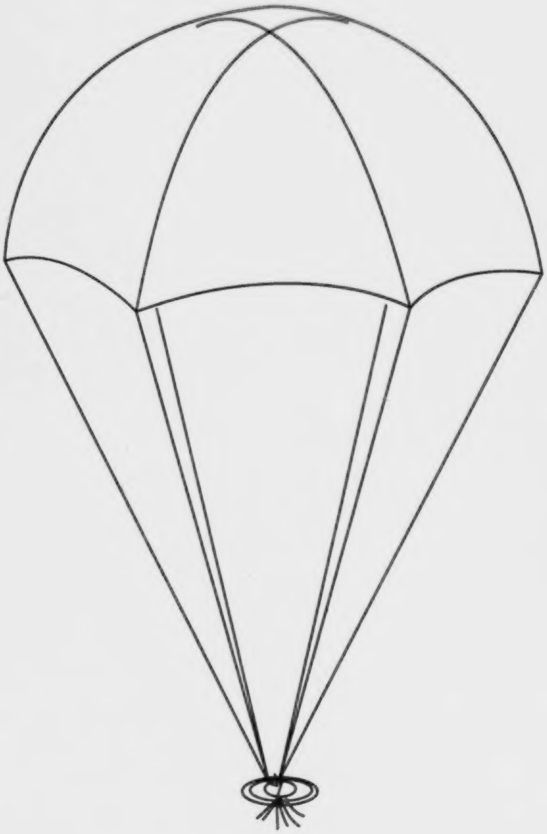


Figure 1

The directions for this project are provided courtesy of
NASA Aerospace Education Services

Working In Space

DESCRIPTION

The following three units provide a series of activities which may be done on an on-going basis with children. If play is the work of children, these activities provide a wealth of opportunities for teachers to promote children's creativity and social understanding through play.

In the three units, suggestions for activities and instructions for designing classroom materials are presented. Use the same discussion about work and occupations presented below as the basis for classroom activities in all three units. The activities are not sequential and may be used in the order which best suits your classroom children.

LIS Unit 3, "Working in Space," helps the children to learn about various occupations related to the space industry and to role play some of these jobs. LIS Unit 4, "Working With Equipment," asks you and the children to make and experiment with a series of space-related equipment designed for space exploration. LIS Unit 5, "Working With Instruments," presents objects which people on Earth as well as astronauts use to understand and appreciate the universe more fully.

UNIT ELEMENTS

- Language development • Classifying • Symbol recognition • Imagining • Small muscle coordination • Social relationships • Experimenting

MATERIALS AND RESOURCES

1. Pictures of astronauts and space community workers.
2. Masking tape, space-related job titles written on cards and symbols of each job.
3. Paper, crayons and art supplies.

ACTIVITY

1. Show the children various pictures of astronauts and others who help operate the space program. Ask the children if they want to pretend to be some of these people.

2. Ask children about jobs which they know that adults have. Lead the discussion by talking about what a teacher or bus driver does for a living. Tell a story about being an astronaut and the work that they do in outer space. Talk about the ground technicians who get the shuttle prepared for space flight. Talk about the people at mission control who watch and make sure everything is all right during a flight. Discuss scientists and engineers who design and test plans for space flight and perform experiments during space flights. Include the security police who help make sure nothing wrong happens to the people and equipment. Discuss fire fighters and why they would be at the space site.

3. Make a circle of X's with masking tape for the children to sit around and place space-related job pictures or other objects and labels with titles in front of each X. Include the astronaut positions of commander, pilot, payload specialist, and mission specialist, as well as technician, mission control, security and fire fighter positions.

Working In Space

4. Ask children to sit where they want after telling them what the words mean. Have some object or pictures which represent the position lying by the title. Helmets, models of a fire fighter, an astronaut riding in an MMU, headphones and a police officer's badge are some examples which could be used. Ask children if they know what the object or picture is and how it is used.

5. Ask children why they chose their occupations. Remind children who did not get their first choice that there will be other times when they will get a chance to pretend to be what they want. Also encourage children to try different roles as they progress though these activities.

6. Let them play at their chosen roles with the information they know (with minimum instruction from you).

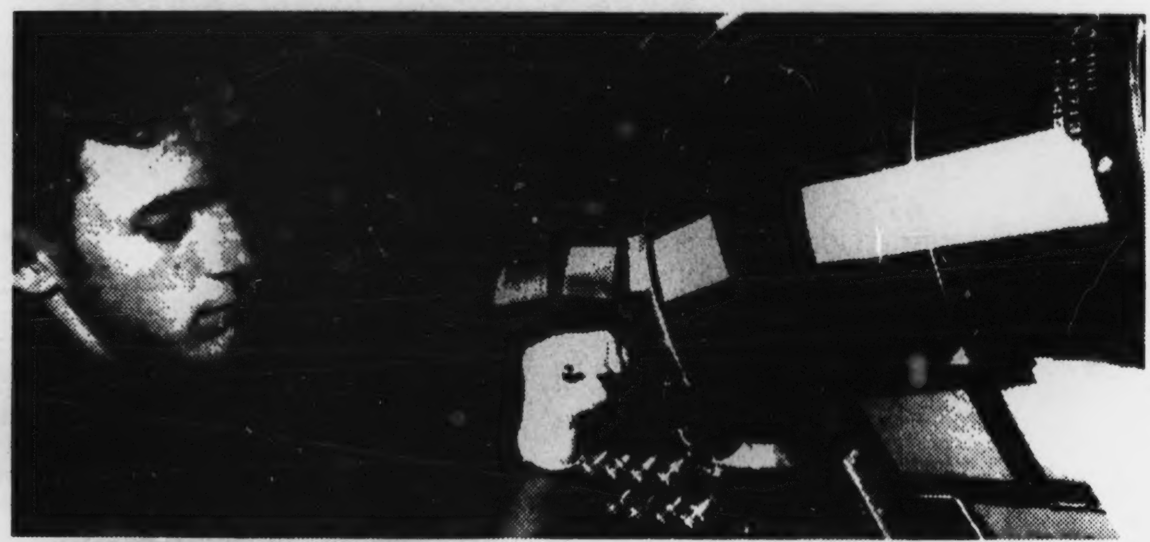
7. Provide art supplies so children can draw who they were and what they did. Discuss artwork if they so choose. Record in writing the descriptions of jobs as they are offered. Save these for a storybook which the children will dictate when you think it is appropriate toward the end of the three units on Work.

An Apollo astronaut retrieves a film canister during a space walk. (NASA Photo)

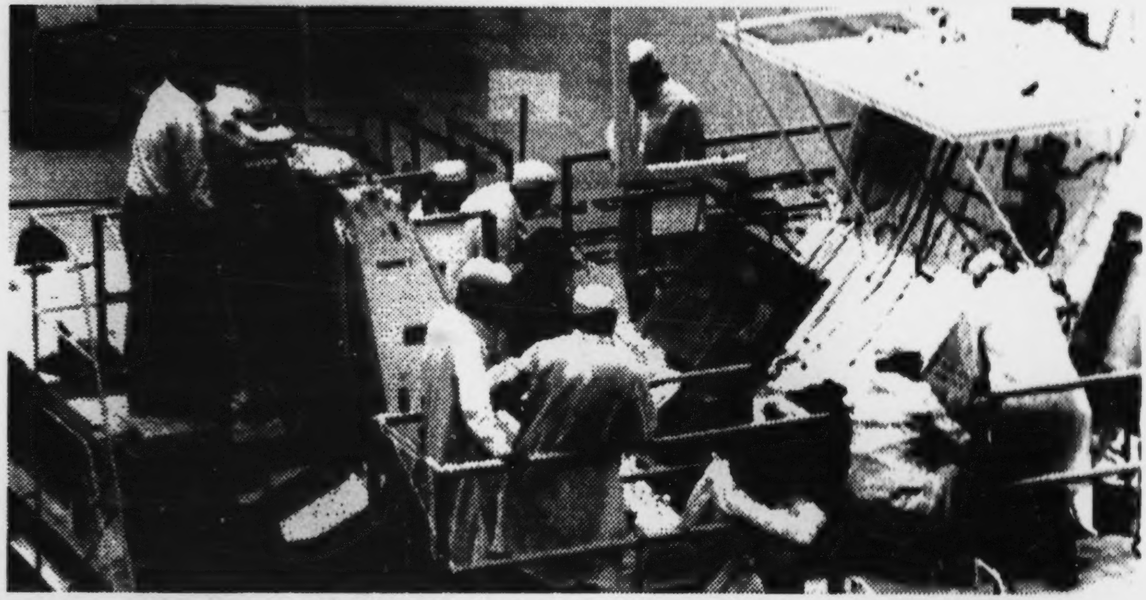
Working In Space

BACKGROUND NOTES

The Commander is in charge of the flight; the Pilot helps pilot the craft. Mission and Payload Specialists are assigned tasks dealing with special assignments and the contents of the payload (Spacelabs, satellites, etc.). The Mission Specialist knows how to operate shuttle systems, i.e., remote manipulation system, electrical systems, satellite deployment and life-support systems. The Payload Specialist works with one particular set of experiments, but does not necessarily know how to operate the other shuttle systems.

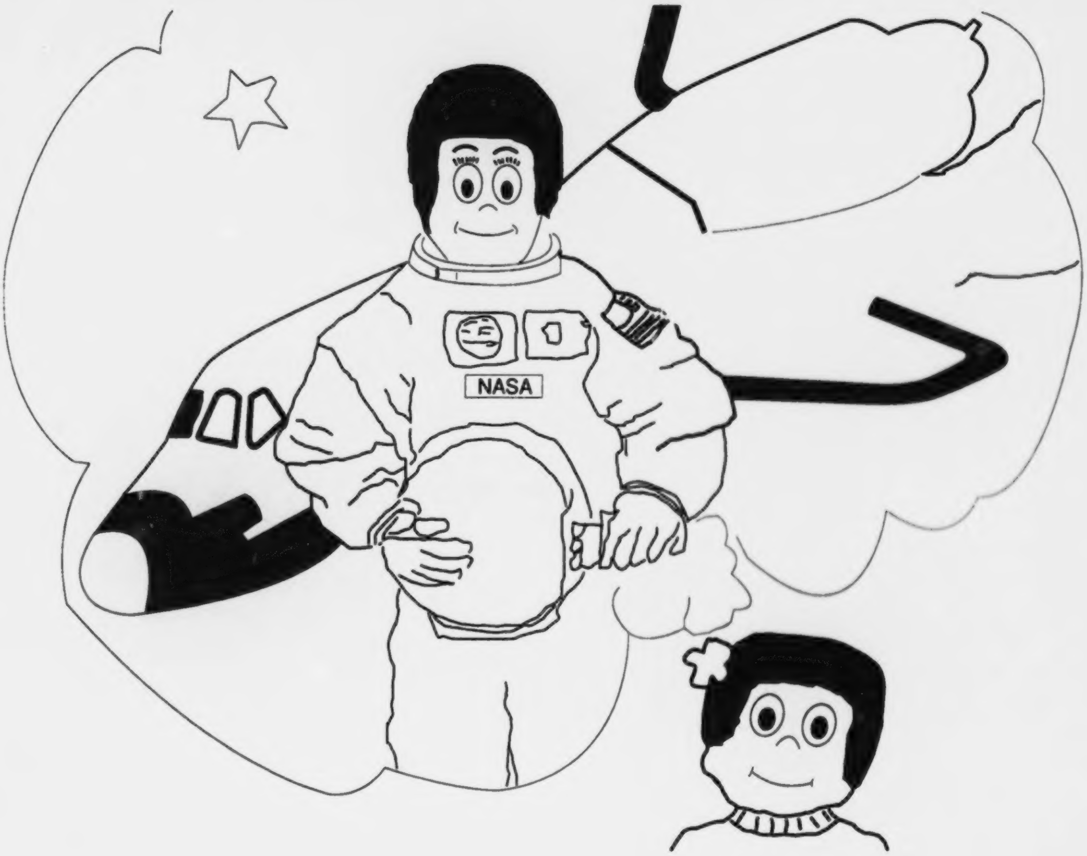


A technician checks heat resistant tiles on a shuttle orbiter prior to launch. (NASA Photo)



Technicians prepare a shuttle payload. (NASA Photo)

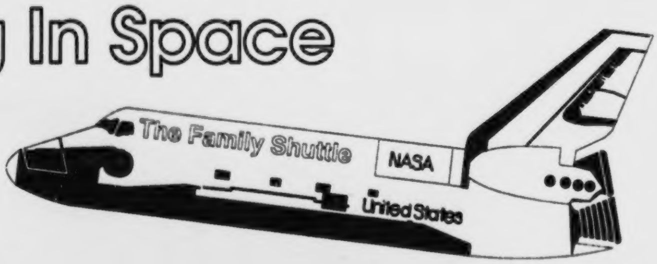
Working In Space



Mario, from the "Youngest Astronauts" storybook thinks about his mother, a misison specialist. (YAC Illustration)

NOTES

Working In Space



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MATERIALS NEEDED

"If You Were An Astronaut" by Dinah Moche, snacks such as dried fruit or carton of juice, belts or sashes to braid together.

ACTIVITY

Your child is talking about and pretending to work in outer space at school. The teacher is explaining about work roles, the necessary equipment for the job and space instruments.

Read "If You Were An Astronaut" aloud to your children. Take plenty of time to say things in your own words and talk about all the pictures with them. Ask questions like:

- Which jobs would be fun to have in outer space?
- What are other jobs that have to be done for people to live in outer space?
- What do the people in Mission Control have to do when a space orbiter is at work?
- Who feeds all these people?
- What would you like to do in space when you grow up?

A mission specialist moves about the payload bay of a shuttle in orbit. (NASA Photo)

Working In Space

An Apollo astronaut retrieves a film canister during a space walk. (NASA Photo)

Want To Give Your Children More Space To Grow?

1. Tell your children it is break time from space work. Give them a snack which astronauts may eat or drink during space travel such as dried fruit or a carton of juice with a straw.

2. Suggest the children call Mission Control down on Earth and tell them how the mission is going. Remind them about space talk and use words like, "Roger," "Over," "Out" and "Standby."

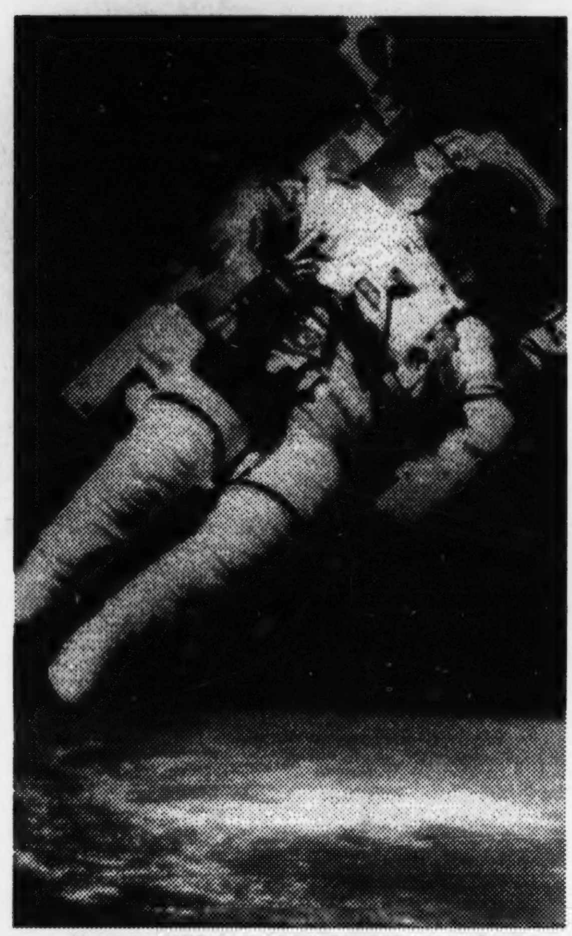
3. Ask your children to report how many storms they saw as they circled the Earth.

4. Suggest that the children pretend to fix the tether which keeps astronauts from floating away from the spacecraft when they work outside. Give them some belts or sashes to braid together to make a strong tether.

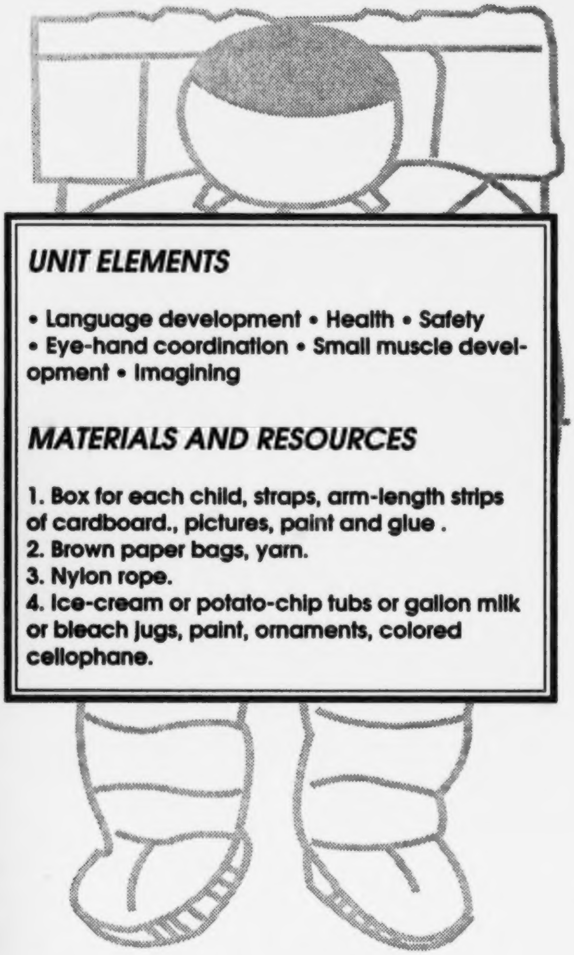
Working With Equipment

DESCRIPTION

The following are specialized, job-related activities. They are a natural progression from the discussion within "Working In Space", LIS Unit 3. Children will become bored and learn very little if they are not directly involved with the creation of these activities. Spread the unit over a period of days and allow the children to be creative in both the construction of the materials and the play they improvise with them.



Above astronaut McCandless uses the Manned Maneuvering Unit (MMU), a complex instrument. (NASA Photo)



UNIT ELEMENTS

• Language development • Health • Safety • Eye-hand coordination • Small muscle development • Imagining

MATERIALS AND RESOURCES

1. Box for each child, straps, arm-length strips of cardboard., pictures, paint and glue .
2. Brown paper bags, yarn.
3. Nylon rope.
4. Ice-cream or potato-chip tubs or gallon milk or bleach jugs, paint, ornaments, colored cellophane.

ACTIVITY

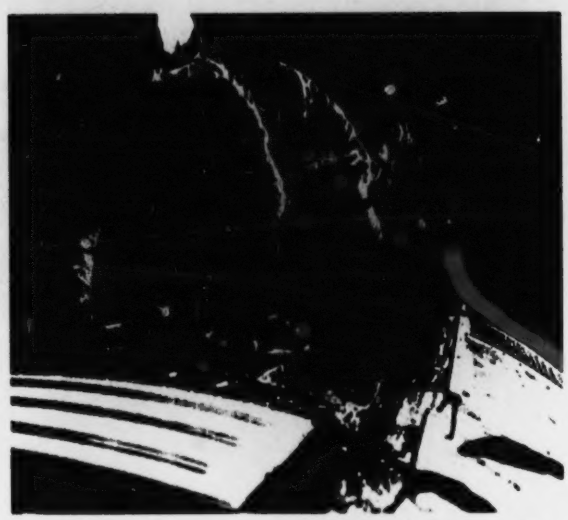
1. Help children make Manned Maneuvering Units (MMU's), a kind of hard-sided backpack with sleeves which have handles at the end. These are used by astronauts to float unrestrained in outer space when they retrieve and repair equipment or do other work in outer space.

Working With Equipment

Explain to children that unless astronauts have some way to control their flight while they are in outer space, they would just float away. MMU's are portable units with little jets that allow them to control where they go. Bruce McCandless was the first astronaut to use one in space. Let the children pretend to float untethered from the class spacecraft during a flight and retrieve a satellite or whatever else they choose. A Payload Specialist may help to repair the broken equipment once it is brought back to the spacecraft.

To make an MMU, find a box a little smaller than the size of a preschooler's back. Fasten criss-crossed straps that will adjust to various children's chest sizes to the ends of box. Cut two, six-inch strips of cardboard the length of children's arms and fasten to the sides of the box. Place a fist-sized hole close to the end of the arms so children may put their hands through the arms. You may want to fasten elastic hand straps near the end of the "arms" instead. By squeezing their hands gently on the straps, children can pretend to direct their MMU. Children can add decorations with pictures, glue and paints.

Astronaut Aldrin prepares to take his first steps on the Moon. (NASA Photo)

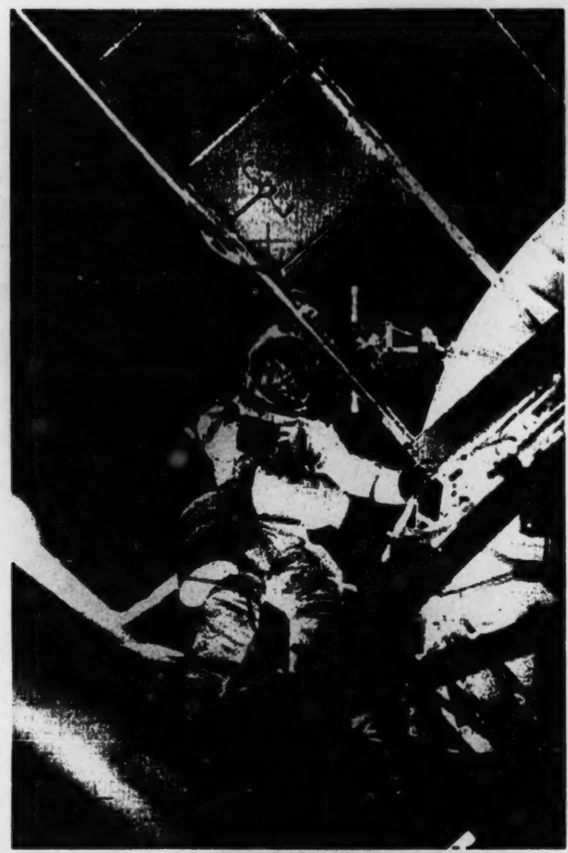


An Apollo astronaut removes a film canister from the service module. (NASA Photo)

2. Help children make another piece of equipment placed on astronauts' backs: a Portable Oxygen Supply system (POS). This looks similar to a backpack, has a two-hour oxygen supply for breathing, but lacks jet propulsion and therefore any ability to guide astronauts in outer space. It is used when astronauts are exposed to outer space while working in the shuttle's cargo bay and could be used when they work on the Moon or Mars' land surface. If children were in outer space, it is more likely they would not use the powerful MMU, but something like the POS. Placing preschoolers in an MMU would be similar to asking them to drive a powerful motorcycle.

A simple way to make a POS is to use a commercially manufactured backpack. Children may have more fun, however, making them from brown paper bags. Make straps by looping yarn through the paper bag. Stuff the bag with crumpled newspaper. Tape the bag closed at the top. Let children be creative and decorate their POS systems.

3. Help children simulate being tethered in space by using nylon rope. Explain to children that astronauts working in outer space need to make sure they do not float away. One way to do this is to be tied to the spacecraft. This is called "tethering." (A horse is "tethered" if tied by a rope to a certain grazing area. There may be other uses for the word in your area which children might know.) Fasten children through a belt loop on their clothing or tie a non-slipping knot loosely around their wrist on one end and anchor the tether to the spacecraft on the other. Ask children to explore their limited ability to move around. Suggest they may want to rescue a broken satellite, repair it at the spacecraft and return it to outer space. (You must supervise this activity closely, as you would any use of ropes with children, to prevent entanglement accidents.)



Working in the shuttle payload bay with a giant "erector set". (NASA Photo)

A close-up view of an astronaut maneuvering in space in the MMU. (NASA Photo)

4. Help children make space helmets to use while they are exploring outer space. Explain that space helmets are necessary for astronauts when they are in outer space to protect them from the extreme heat and cold. Helmets also keep the Sun's harsh rays from hurting their eyes and protect them from small particles in space which may strike them. In addition, space helmets have communications equipment inside them so the astronauts can talk with the spacecraft and Mission Control on Earth. Air to breathe is pumped into the helmets, thereby requiring no cumbersome mouth and nose pieces.

There are various ways to make a space helmet. Large ice cream or potato chip tubs, gallon milk or bleach jugs and natural fiber waste paper baskets are mostly used for the basic helmet. Help children be creative, but ensure that children do not block their vision, hearing or breathing with their inventiveness. Provide children with paints and other potential ornaments for their helmets. Different colors of cellophane over the eye shield area will produce different visual effects for the children. Leftover handles from plastic milk gallon jugs may be used as a hand-held communication system.

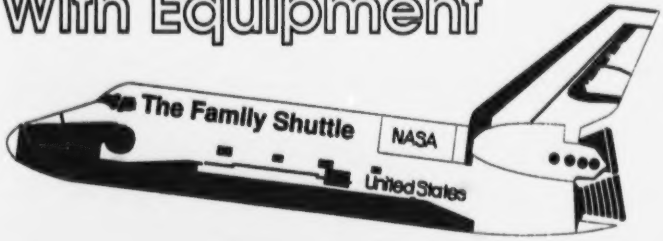
Helmet ideas submitted by Northumberland Area Head Start, Lewisburg, PA ,and Corning Head Start, Corning, AZ

BACKGROUND NOTES

Astronauts need a lot of equipment to live and work in space. Some of the equipment is in the form of instruments and controls. Other equipment may be items for protection and propulsion, like spacesuits, space helmets and small rocket backpacks.

NOTES

Working With Equipment



BACKGROUND NOTES

Astronauts need a lot of equipment to live and work in space. Some of the equipment is in the form of instruments and controls. Other equipment may be items for protection and propulsion, like spacesuits, space helmets and small rocket backpacks.

MATERIALS NEEDED

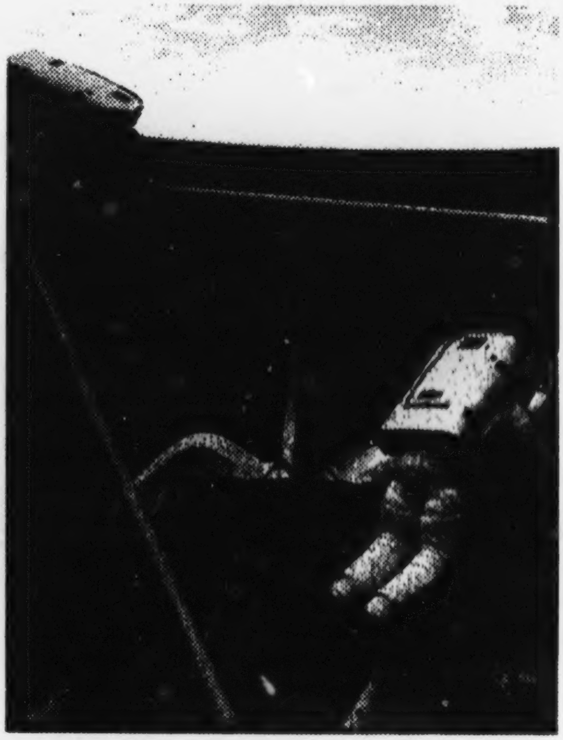
Gallon milk cartons or bleach jug or cardboard ice cream tub, colored cellophane or plastic wrap, crayons or felt markers and glue.

ACTIVITY

This activity is a continuation of the series on work. The children are concentrating on special space equipment at school and are making Manned Maneuvering Units (MMUs), Portable Oxygen Supply (POS), space tethers and helmets.

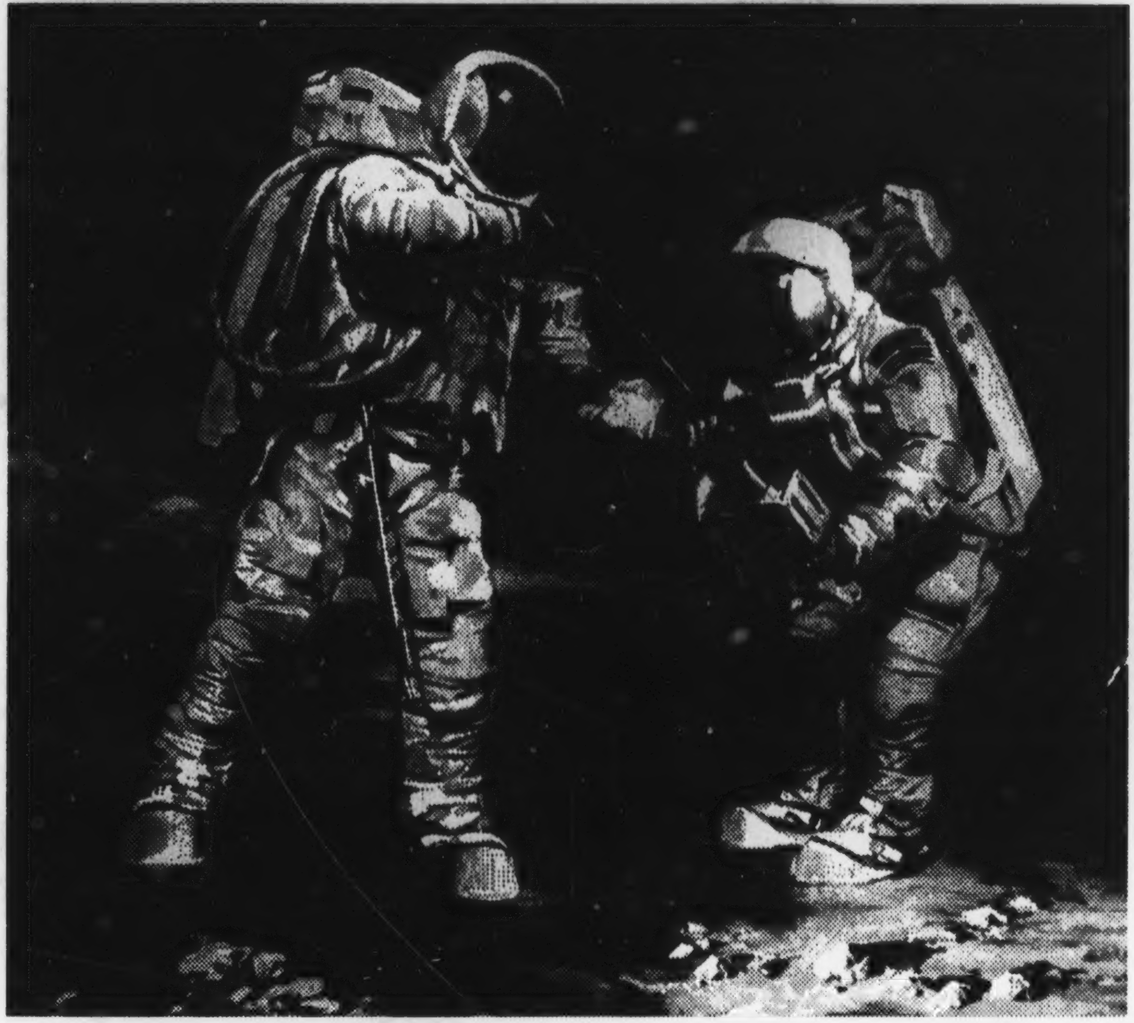
Help your children make space helmets to use while they are pretending to explore outer space at home. Explain that space helmets are necessary for astronauts when they are in outer space to protect them from the extreme heat and cold. Helmets also keep the Sun's harsh rays from hurting their eyes and protect them from small particles in space which may strike them. In addition, space helmets have communications equipment inside them so the astronauts can talk with the spacecraft and Mission Control on Earth. Air to breathe is pumped into the helmets thereby requiring no cumbersome mouth and nose pieces.

Use a large, empty milk carton, bleach jug or cardboard ice cream tub to cut into a space helmet for your children. Used colored cellophane or plastic wrap to make the face shield. Let your children help you paste the parts together. Help them make designs on the helmet by supplying crayons and/or felt-tip pens. You can print each child's name on the front top and then you can point to each letter as you tell your preschooler what it is called. Let all your children look through the helmet in daylight and in artificial light and compare the difference.



Working in the shuttle payload bay . (NASA Photo)

Working With Equipment



Artists rendition of astronauts working with sampling equipment on the moon. (NASA Photo)

Want To Give Your Children More Space To Grow?

Sit by a window and look out at the sky. Pretend that you and your children are seeing a spacecraft go by. Talk about the equipment an astronaut would have to wear in outer space in order to leave the spacecraft and fix a broken satellite. Ask your children to tell you how astronauts breathe when they are outside the orbiter and how they move themselves around in outer space as they work on the satellites.

Working With Instruments

DESCRIPTION

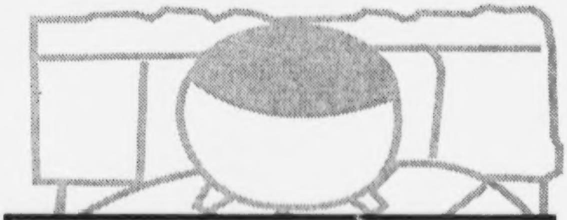
These activities introduce children to some "tools of the trade" for astronauts and scientists and relate to the previous two Living In Space units on Work. Classroom activities should be built on what the children already know through earlier "work" discussions and play. Let the children participate actively in the making of the instruments and encourage them to use their imaginations during play.

A NASA technician examines lunar rock samples. (NASA Photo)

ACTIVITY

1. Make an "Experiment Box" for the children to play with after explaining that Mission Specialists experiment on the Skylab and space shuttle by using a box that is sealed tightly so that nothing, not even a small germ we cannot see, can get inside. Children can experiment on their own by placing their hands in the openings and trying various things. Let the children practice with zipper and button frames or encourage them to experiment by mixing food coloring and water in plastic bags. Allow them to plant seeds in plastic bags of dirt, sand or cotton.

To make an experiment box, take a box with the top cut off, tape clear plastic wrap over the top and cut two circles for children's hands and arms about six inches apart in the middle of one side.



UNIT ELEMENTS

• Small muscle coordination • Safety • Language development, •Symbol recognition • Health • Science • Art • Observing

MATERIALS AND RESOURCES

1. Boxes, clear plastic, zipper and button frames, food coloring, plastic bags, water, seeds, dirt or sand or cotton.
2. Popsicle sticks, pipe cleaners, glue, construction paper, magazine pictures, etc., small boxes from grocery store.
3. Toilet tissue tubes, paper towel tubes, magnifying glass, binoculars and telescopes (optional), paint or crayons, construction paper, colored cellophane, masking tape.
4. Shoe boxes, magazine pictures of sky, outer space and Earth, bar soap, paper towel, toothbrush, etc.
5. Camera (optional), small boxes (such as jewelry boxes), masking tape or glue.

Be sure circles are low enough to allow arms and hands to reach the bottom of the box once they are inside. You may want to reinforce the edges of the circles with masking tape, or place tape in circles on the wrap first, then cut out the plastic wrap circles.

2. Help children make satellites from various commercially available, classroom materials or use Popsicle sticks, pipe cleaners, glue, construction paper, magazine pictures and any other materials of interest to the children. Get some small boxes from the grocery store and let children use their imaginations.

Working With Instruments

Tell the children that the very first, artificial satellite was not put in orbit by Americans, but by people in another country, the Russians, way back in 1957. The only thing that it did was beep while it circled the Earth, so people could keep track of it. (See "Working In Space"- Section 7, SATELLITES for more detailed activity information.)

3. Let children experiment and explore their classroom and outdoor areas with real binoculars and telescopes, if available, and with magnifying glasses, which should be available. Explain to children the function of these optical helpers by explaining that magnifying glasses help us see distant things more closely. Tell them that binoculars and telescopes work the same way with things further away.

NASA's launching of the giant Hubble Telescope will let scientists see stars and other things in the galaxy that could not be seen before. This telescope is part of a satellite and will orbit the Earth with a camera attached so that what the telescope sees will be sent by a camera back to Earth.

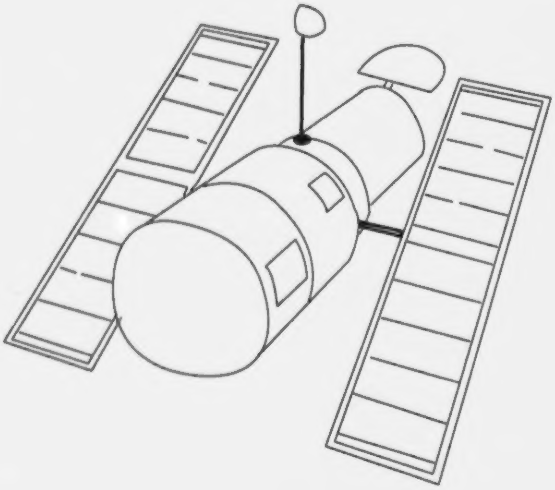
Make binoculars and telescopes with the children from toilet tissue and paper towel tubes. Encourage children to play with their pretend binoculars and telescopes and share what they see. As with all activities that ask children to look into the sky, caution them not to look directly into the Sun. This is especially important when they are experimenting with optical lenses.

4. Make Space Boxes with children in which they can pack their personal items for space exploration or store Moon rocks and Earth flowers. They may want to keep small projects which they have made during these units in the box.

Explain to the children that astronauts are allowed to take a limited number of personal items with them when they travel in the space shuttle. Astronauts also have personal hygiene compartments on the space shuttle. Let children make a space box in which a small soap bar, a paper hand towel, a protected toothbrush and other hygiene items are put for use during toileting and brushing times.

Use shoe boxes with covers for Space Boxes. Let the children glue magazine pictures of the sky, outer space and Earth to their boxes or decorate them with other creative techniques. Talk about the boxes with the children and what they will put in them. Provide a place in the classroom where their boxes may be kept.

5. Use a camera with children. Take some pictures of activities and post them in the classroom. If available to you, take a picture of the classroom children with an Polaroid camera and let children watch it develop. Or provide guidance and help as they use a Polaroid camera for selected photos they take themselves.



The Hubble Telescope. (YAC Illustration)

Working With Instruments

Ask children what they know about cameras. Explain that cameras take pictures of the Earth, the sky and outer space and show examples of space pictures. Find out how the children believe these pictures were taken. Help children understand that some satellites contain cameras and allow us to take photographs of distant objects in the universe.

Ask children if they want to make pretend cameras and take imaginary pictures of things in the sky or space.

Children can make cameras with small boxes, such as jewelry boxes. Cut a small viewfinder hole in the back of the box and a larger lens hole in the front of the box. Make sure the holes line up when the cover and the box are put together. Let the children put the two box pieces together. Provide them with masking tape or glue. Ask them to put the two pieces together and fasten them. Supply crayons for the children to decorate their cameras.

Allow children to explore with their cameras and take pictures of whatever they want. A group picture of the Youngest Astronauts beside their spacecraft may be one idea.

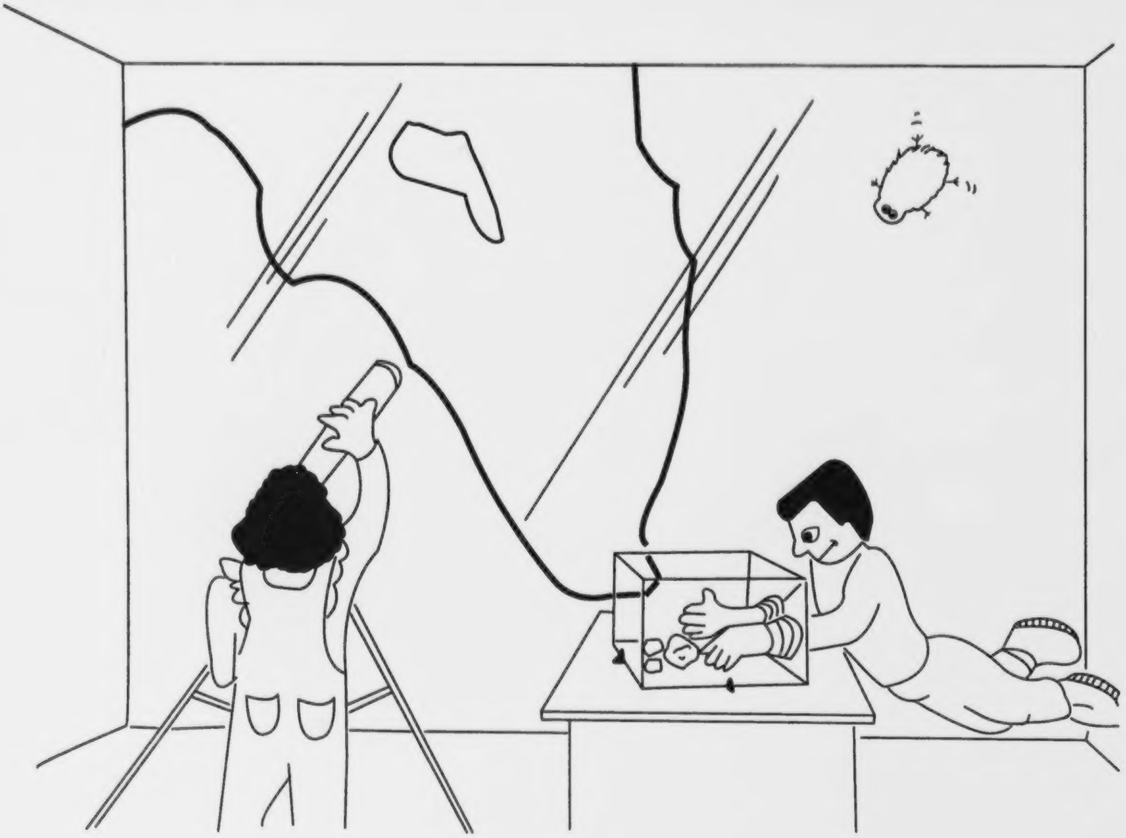
Explain that each picture has to be developed before they can see it. Ask children if they will draw one of their pictures that they shot with their camera. (Do not confuse the children by asking them for one of their photographs. They need to know that a photograph is not drawn artwork.) Discuss the artwork when they have finished.

BACKGROUND NOTES

Instruments are devices that give information. They can give you information by relaying measurements or by permitting you to make decisions. For example, an automobile speedometer will measure and tell you how fast you are going. Similarly, the oil pressure light in your car will flash to tell you that you need to add oil. Scientific instruments measure physical or chemical properties which can be analyzed or studied to learn things. A telescope, for example, collects the light from planets or stars to give you information about those heavenly bodies.

Practicing with space instruments. (NASA Photo)

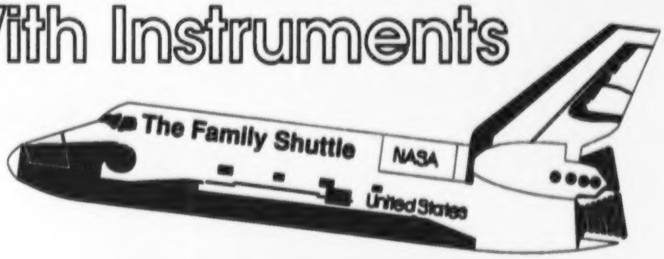
Working With Instruments



Kim looks through a telescope while Mario carries on other experiments, from "The Youngest Astronauts" storybook. (YAC Illustration)

NOTES

Working With Instruments



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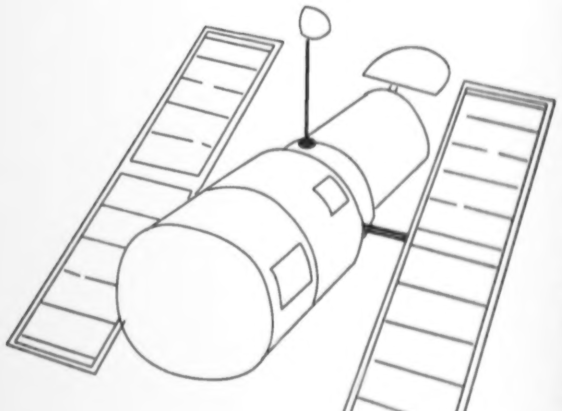


The Hubble Telescope. (YAC Illustration)

MATERIALS NEEDED

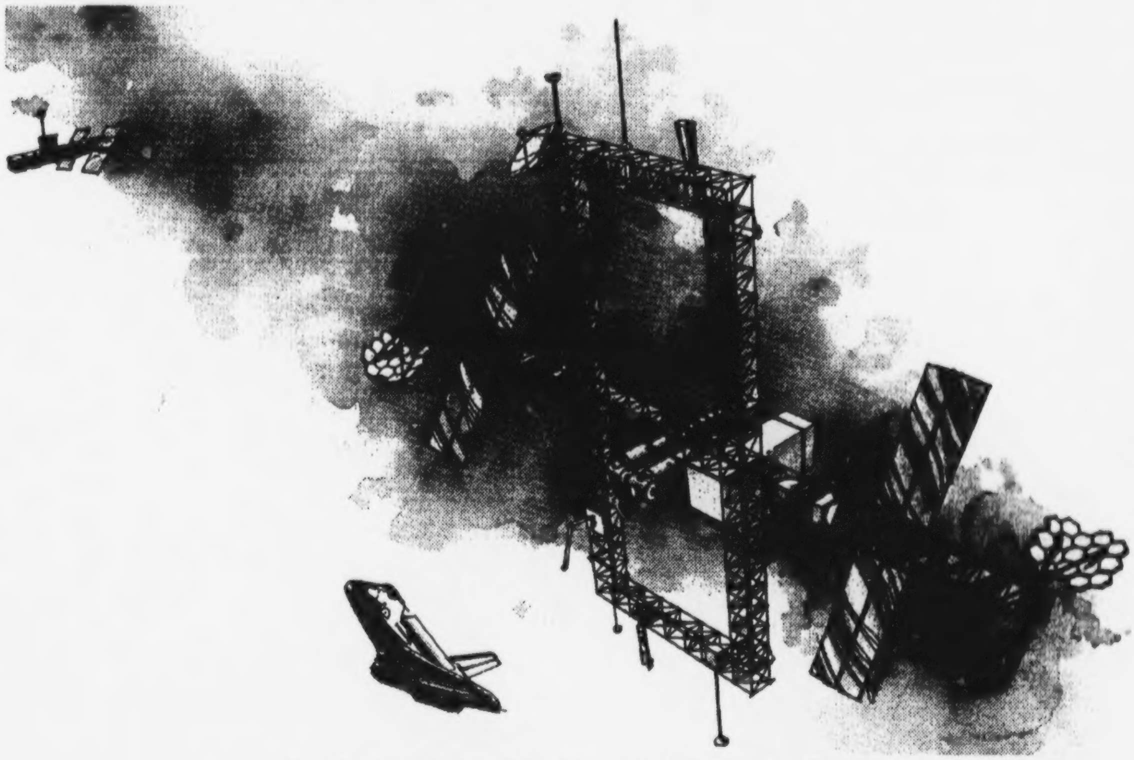
Camera (optional), paper, pencil, crayons, shoe box or other small box, magazines with pictures, scissors and glue.

An astronaut digs for Lunar samples. (NASA Photo)

Working With Instruments

ACTIVITY

If you have a camera, take pictures of your children in the space helmets you have made for them. Use the pictures to illustrate a story about your family going on a trip to the Moon. Ask your children to tell you, one at a time, what personal items they would like to take with them. Ask them to pretend that an orbiting satellite is broken and they have to fix it on their way to the Moon. How would they do it? How could they get some Moon rocks to bring back to Earth? Write a one-page story about what they might see through a telescope on the trip to the Moon. Give your children crayons and paper to draw a Moon landscape. Pin the pictures up and talk about them everyday this week.



An artists' conception of the soon to be built space station.
(NASA Photo)

Want To Give Your Children More Space To Grow?

Use small boxes such as a shoe box for your children to make Space Boxes in which to keep their favorite things. Give them magazines with pictures, scissors and glue and let them decorate their boxes.

Exploring The Moon

DESCRIPTION

This activity stimulates children to use their imagination and fragments of understanding about astronauts, space travel and outer space by simulating a space expedition. Encourage curiosity and inventiveness from the children as they progress through their space "field trip."

ACTIVITY

1. Read "Mooncake" by Frank Asch (New York: Prentice-Hall. 1983) to the children. Discuss exploring and observing with them. Ask the children if the bear really went to the Moon and if he had fun. Read a story about space exploration from the Resource Bibliography selections and discuss space exploration. Ask the children if they ever have gone exploring.

An Apollo astronaut gathers lunar rock samples. (NASA Photo)

UNIT ELEMENTS

- Language development • Imagining
- Classifying • Thinking • Social relationships
- Science • Math •Small muscle development

MATERIALS AND RESOURCES

1. Book: "Mooncake" by Asch or a story about space exploration.
2. Food, drink, space suits, helmets, collecting boxes, telescopes, binoculars, cameras, flags and record-keeping materials.
3. Hoola hoop or spliced section of garden hose and a sign: "Space Samples" or "Scientists at Work."
4. Magnifying glasses, rock, plant and other appropriate resource books.
5. "Let's Go to the Moon" by Chester.
6. "Guessing sock" with common objects inside, mystery "smell can". (Suggestions: chocolate, vinegar and peanut butter.)
7. Tape of common sounds.

2. Suggest an exploration trip to the children. Perhaps the Moon or Mars is a good place. Maybe they have suggestions of their own. Help them plan, list and collect what they need to take. Be sure to include food, drink, space suits, helmets, collecting boxes, telescopes, binoculars, cameras, flags and record-keeping materials.

3. Take the children outside with their gear. Since you want to simulate traveling in a small, cramped area like the astronauts inhabit while on board the shuttle, take a hoola hoop or a spliced piece of garden hose with you and have

the children stand inside the hoop during their traveling time to their destination.
(Idea submitted by Lee County Head Start, Fort Myers, Florida.)

Stand closely together with the children inside the hoop. Tell children to pretend they are inside their spacecraft. Close eyes. Countdown together. Lift-off. Tell children to open their eyes and announce to them that you have reached your destination.

4. Encourage children to explore. They can take pictures, plant flags, collect rocks, leaves and other available items, and enjoy a snack. Encourage them to notice new things and maybe crawl on the ground to discover small things.

5. Return to Earth by getting into the hoola hoop spacecraft and recreate the traveling sequence. Once inside the classroom, specify a place where children may put the expedition samples they have collected. Make a sign for the area denoting it as "Space Samples" or "Scientists at Work."

6. Give the children magnifying glasses to look at the gathered samples. Help them observe details, label, name and classify objects, observations and findings. Count the number of each kind of sample. Have rock, plant and other appropriate resource books to look up information if children are interested. Display objects and children's names for the objects and share with parents. Children may want to examine their objects by using the Experiment Box. (See Living in Space - Unit 5.)

You may guide this process, if necessary, by encouraging children to observe (and you record) their own sensations. Does it make a sound? What does it smell like? Feel like? Do you think we should taste it ? (No!) Why not? How could we tell someone at home what it looks like? Ask open questions, record each opinion and observa-

Astronaut Alan Aldrin climbs down the ladder of the Lunar Excursion Module (LEM) to become the second man on the moon. (NASA Photo)

Exploring The Moon

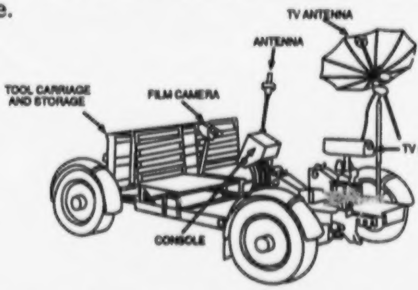
tion. You may want to follow through with the dramatic play of exploring the Moon or Mars by having your laboratory in space or in the space shuttle orbiter area.

7. Show pictures and read selected portions of "Let's Go To The Moon" by Michael Chester (Putnam. 1974). Let the children's interest in the pictures guide which parts of the book you read.

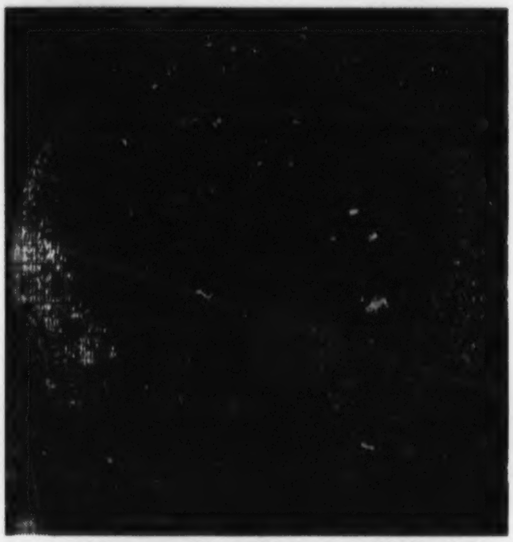
8. With the children, talk about what it would be like to explore without being able to see. Help them understand this by passing around a "guessing sock" (common objects inside a sock). Let them reach into the sock without being able to see what is inside. Ask them to identify the object if they can, but keep the answer to themselves until all the children have a turn.

Repeat the same activity by creating a mystery "smell can." Place safe items with identifiable scents into plastic jars, one substance in each jar. Chocolate, vinegar and peanut butter work well. Caution children against sniffing directly from the container. Let children experience the scent by wafting your hand over the jar as each child leans over to smell.

9. Play a cassette tape you have made of common sounds, such as those made by a television, radio, telephone, car or glass being broken, and ask children to guess the objects making the various sounds. Summarize the touch, hearing and smell activities by noting that all the senses are important to explorers and scientists as they discover new things about the world in which we live.



A drawing of the lunar rover used to travel on the moon's surface. (YAC Illustration)



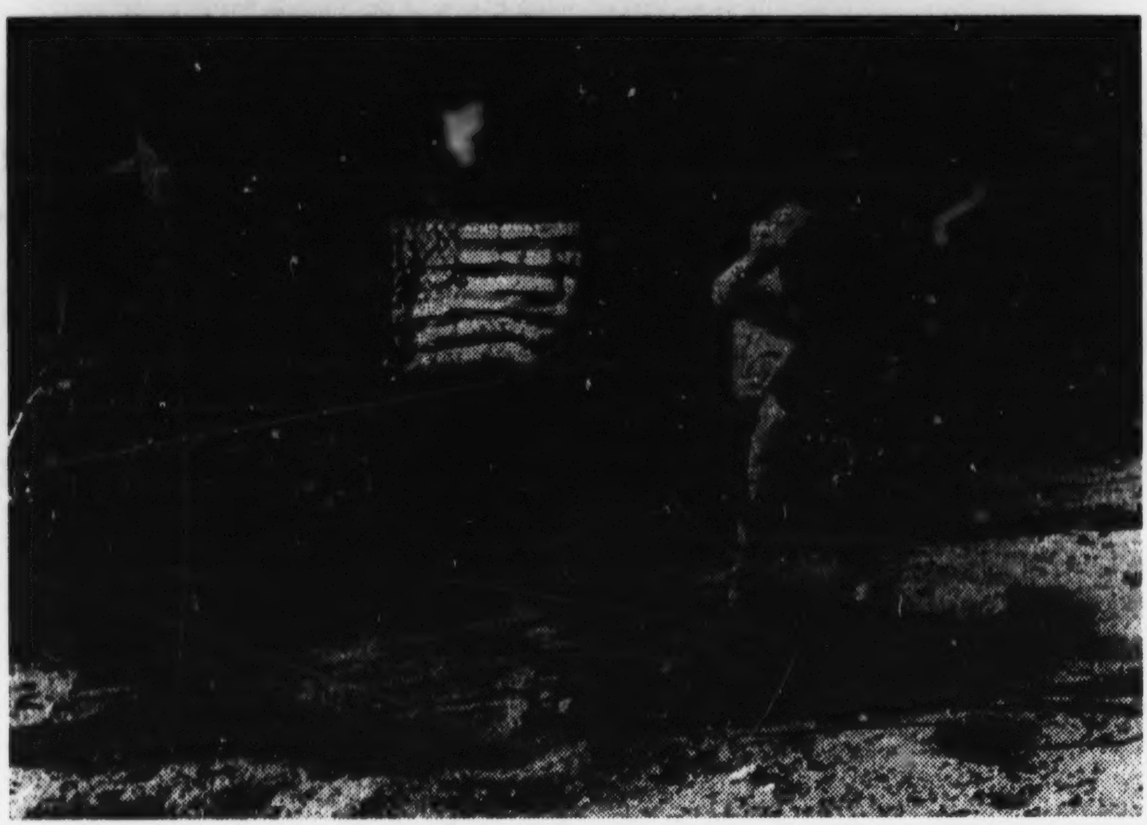
A map of the near side of the Moon . (National Geographic Photo)

BACKGROUND NOTES

The United States landed the first man, Neil Armstrong, on the Moon in 1969. Since then, Americans have made six other trips there; five of which landed. The last one was in 1972, before the children in your class were born. Apollo 7 tested the Command Module. Apollo 8 orbited the Moon. Apollo 9 tested the Lunar Module. Apollo 10 tested the Command Module and the Lunar Module at the Moon, but did not land. Apollo 11 was the first Moon landing and Apollo 12 was the second landing. Apollo 13 incurred an explosion, went around the Moon and came straight home. Apollo 14 used a land rover "dune buggy" on the Moon. Apollo 15, 16 and 17 landed and performed scientific explorations and experiments.

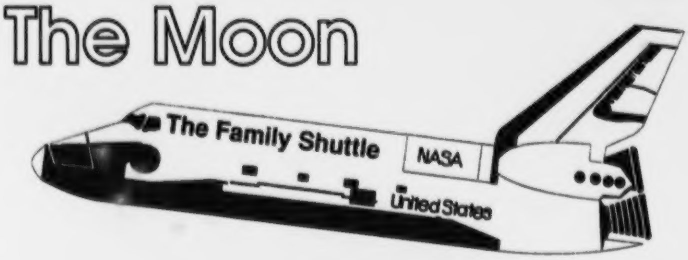
The Moon has not been fully explored and it is probable that further exploration and possible settlement will occur in coming decades. Because the Moon is such a visible object to young children (and the rest of us), it is easier to imagine going there on a spacecraft than to a planet which looks as tiny as a star to us.

Exploring The Moon



Astronaut Alan Aldrin salutes the flag. Note that the American flag is unfurled with the help of a stiff metal rod. It would not fly" as it would in a breeze here on Earth because there is no wind on the moon.
(NASA Photo)

Exploring The Moon



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ACTIVITY

In school, children are being encouraged to use their imagination and develop observation skills while they pretend to explore Mars or the Moon. The entire family can help younger children develop labeling, classifying and observation skills by having fun with the following activities.

Ask your children if they would like to pretend to take a trip to a faraway planet. Ask them to think of somewhere and discuss what they think it is like. Ask them if they would like to explore that planet. Take the children on a walk to a place in the neighborhood where they have never been.

Help them explore this new place. Provide them with a paper bag, so they can collect rocks, leaves and other safe items which they find. Encourage your children to notice new things and maybe crawl on the ground to discover small things. Ask them if they want to draw pictures of what they see or discover once they get home. At home, help them classify and label objects which they found. Write down words which they use to describe their objects.

Exploring The Moon

Pack a snack and let the family enjoy eating outside together while the children explore. Use this opportunity to discuss litter and the need to keep Earth litter-free.

MATERIALS NEEDED

Paper bag, paper, pencil, crayons, snack, a sock with common objects inside, a small plastic jar, cotton balls with scents such as vanilla flavoring vinegar, lemon or orange slices, pickles and pieces of soap.

Astronaut Alan Aldrin salutes the American flag while exploring the Moon. Note that the flag is unfurled with the help of a stiff metal rod. It would not "fly" as it would in a breeze here on Earth because there is no wind on the Moon. (NASA Photo)

Want To Give Your Children More Space To Grow?

1. Ask your children what it would be like to explore without being able to see. Help them understand this by making a "guessing sock" (common objects inside a sock). Let them reach into the sock without being able to see what is inside. Ask them to identify the object if they can. Give hints if they need them.

2. Repeat the same activity by creating a mystery "smell can." Place safe items with identifiable scents into a small plastic jar. Dip cotton balls into liquid scents before placing them into jars to avoid spills. Vanilla flavoring, vinegar, lemon or orange slices, pickles and pieces of soap work well. Caution your children against sniffing directly from the container. Let them experience the scent by wafting your hand over the jar as they lean over to smell.

Directionality

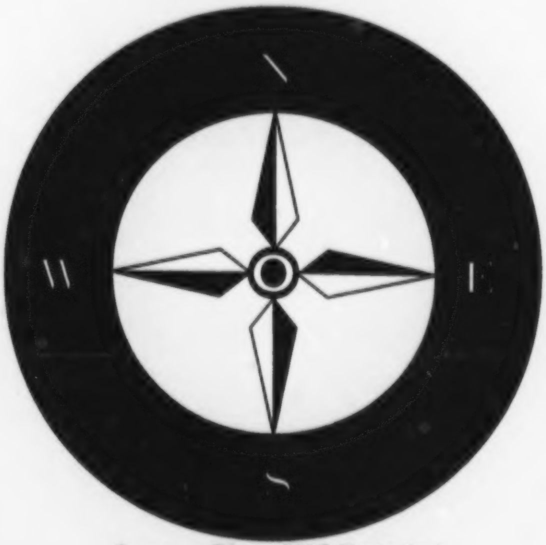
DESCRIPTION

This activity helps children think about directions. North, South, East and West, as directions, are abstract concepts and difficult for preschoolers to understand.

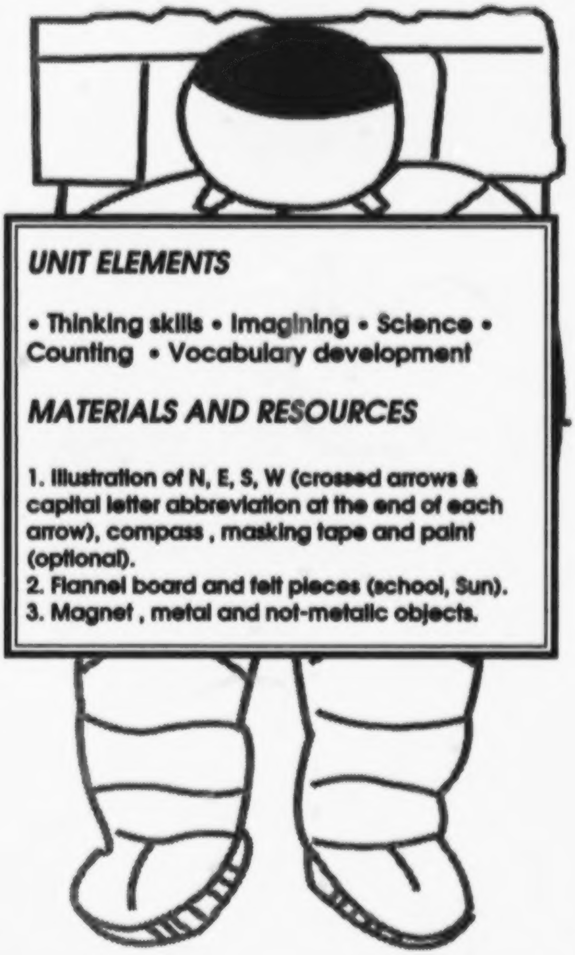
However, signs indicating directions are present in their environment. Ask bus drivers to call attention to route signs with a direction on them as they transport children; ask parents to do the same as they ride with their children. Use the same opportunities yourself to point out direction signs during walks or field trips with the class. A walk to observe these signs and what they tell people might be a good start.

ACTIVITY

1. Talk about the process children would use to get to certain places. Ask them to explain how they would get from the classroom to the bathroom or to the playground. They might make and post arrows to indicate the way. Let them explain how they get home from school. Perhaps they can explain how the bus driver or a parent knows how to take them to their home.



Compass Rose. (YAC Illustration)



UNIT ELEMENTS

• Thinking skills • Imagining • Science • Counting • Vocabulary development

MATERIALS AND RESOURCES

1. Illustration of N, E, S, W (crossed arrows & capital letter abbreviation at the end of each arrow), compass , masking tape and paint (optional).
2. Flannel board and felt pieces (school, Sun).
3. Magnet , metal and not-metalic objects.

2. Ask children how they would get somewhere if they or their parents had not been there before. After they have discussed various answers, tell them that you are going to show them a system that people use to find their way. It is the same for all people in all countries, no matter where you are on Earth.

3. Introduce the children to an illustration of North, South, East and West with crossed arrows and capital letter abbreviations at the end of each arrow. (Locate and duplicate an illustration from a map if this is easier.) Using a

Directionality

compass, accurately place the illustration in front of the children. Practice the words with them.

4. Make the directions from masking tape on the classroom floor. Be sure the symbol is oriented correctly, that "N" is really pointing North. Try a few examples of using directions with the children in the classroom. Ask one of the children to go south to the classroom door. Ask another child to go east to the block area.

Let children practice this as a game. Vary it and ask, "In what direction is the bathroom or the housekeeping corner?" Have one child ask another to walk in a certain direction.

Introduce numbers by asking children to walk three or four steps south from the center.

Let children practice their space vocabulary with directions, such as:
"Kim, this is Mission Control. Walk two steps north. Over."
"Roger, Mission Control. Over."

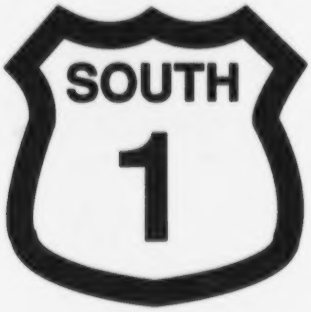
Let the children practice directionality during astronaut dramatic play. Perhaps they could rescue a broken satellite west of their spacecraft.

Extend the directionality play outside by painting or taping the compass directions on the playground.

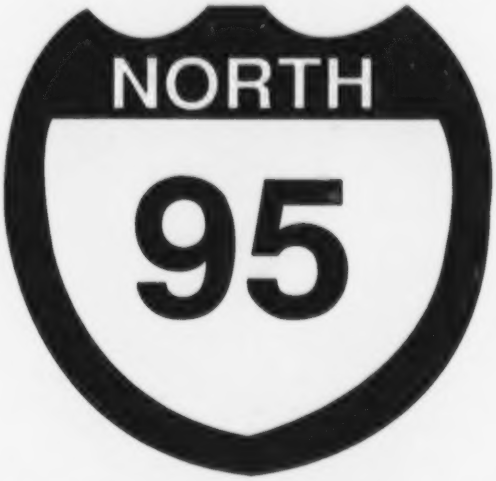
5. Show the children that the Sun always follows a pattern in the sky, traveling from east to west in our sky. Go outside with the children early in their school day. Take a flannel board. Sit so that the children see the Sun to the left or right of the school building. Place a flannel piece in the center to represent school. Place compass directions on the flannel board also. Ask children where to place the Sun. Tell the children that the Sun always moves east to west. Let the children draw what they see with crayons. Later in the day, use the flannel board again. Ask the children where the Sun is now and have them help you move it on the flannel board. Do this periodically with the children throughout the week.

6. Demonstrate compass operations to children. Tell them that the needle always points north. Let interested children experiment with the compass. Ask children to try and walk north while holding the compass.

7. If you have magnets, put a variety of materials, metal and non-metal, on a table and let the children experiment with them. Talk about which objects can be pulled or lifted by the magnet.



A state highway sign indicating direction. (YAC Illustration)

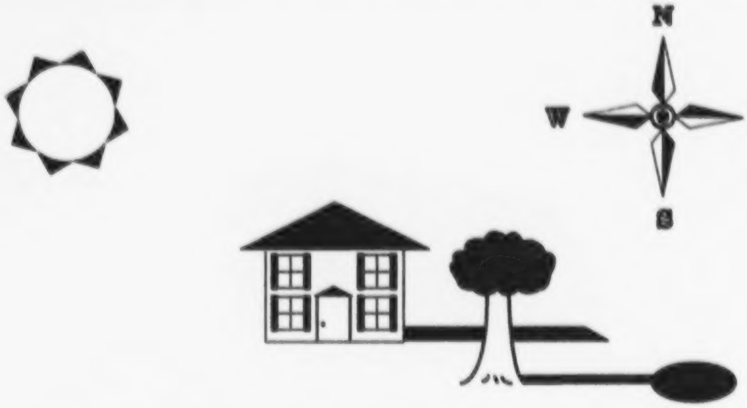


An interstate highway system sign indicating direction. (YAC Illustration)

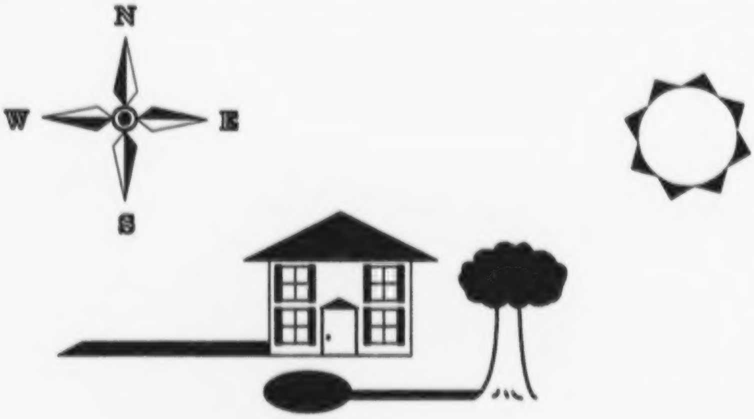
Directionality

BACKGROUND NOTES

The Earth is a giant magnet. Magnets have two poles: North and South. The Earth has a North and South Pole, too. When two magnets are near each other, they attract or repel each other. A compass is a small magnet. It is attracted by the Earth so that the needle points North and South. If you know where North is, you know where South, East and West are.



Afternoon Sun (YAC Illustration)

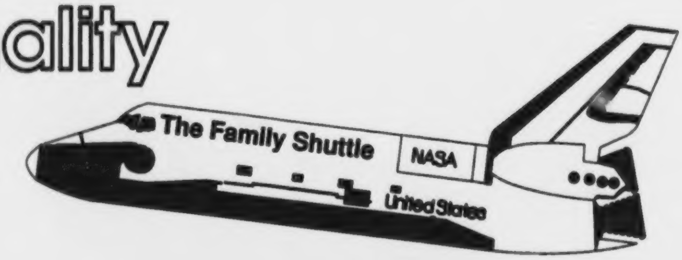


Morning Sun (YAC Illustration)

Directionality

NOTES

Directionality



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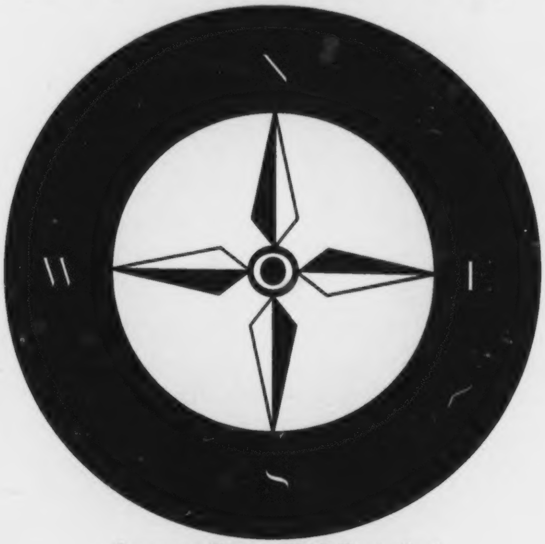
ACTIVITY

Children are learning about compass direction at school. You can help your children recognize North, South, East and West as directions by using this activity. Directions are a hard concept for preschoolers to understand. Play these games from time to time with your children to help them gradually understand directionality.



Compass Rose. (YAC Illustration)

1. Ask your children what they know about directions. Tell them that the Sun rises in the East and sets in the West in our sky. Let them know that if it is around noon and they are facing the Sun, it is South. Make a paper compass from the illustration and place it accurately on the floor. Go over the direction words with your children and let them repeat them.

Let your children practice compass directions. Ask one of your children to go south in the room away from the compass that you made. Ask another child to go east.

Let your children play at this game. Vary it and ask, "In what direction is the TV?" Or ask, "In what direction is the kitchen?"

2. Introduce numbers by asking your children to walk three or four steps north from the compass. Let children practice their space vocabulary with directions, such as:

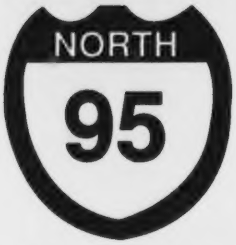
"Kim, this is Mission Control. Walk two steps north. Over."
"Roger, Mission Control. Over."

Take your children outdoors and play the same game with them.

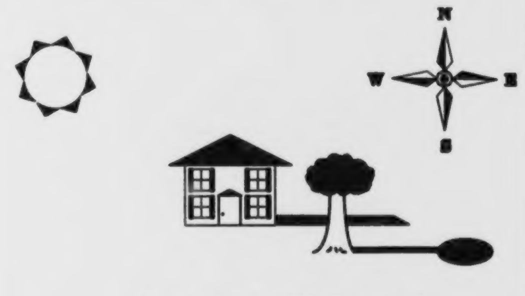
MATERIALS NEEDED

Paper, compass.

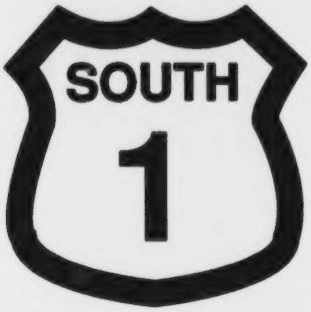
Directionality



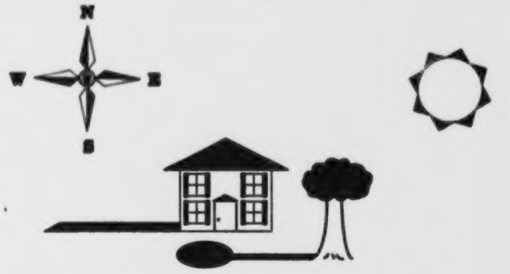
An interstate highway system sign indicating direction. (YAC Illustration)



Afternoon Sun (YAC Illustration)



A state highway sign indicating direction. (YAC Illustration)



Morning Sun (YAC Illustration)

Want To Give Your Children More Space To Grow?

1. Help your children understand that the Sun travels east to west in the sky by taking them outside at least twice during the day and pointing out the Sun's position.

Take them outside on a bright morning. Try to have children stand so that there is a building (or some object) in front of them in the distance. Ask them where the Sun is. (Be careful that they do not look directly at the Sun. That is harmful to their eyes.) Tell them that they are looking East because the Sun always rises in the East.

Take your children outside later in the afternoon to the same spot and ask them where the Sun is. Explain to them that the Sun sets in the West. Do this a few time with your children. A building in the distance helps children realize how much the Sun has moved during the day.

2. When you are riding with your children, point out road signs which include a direction, such as "US Rte. 1, South."

Sharing/Measuring

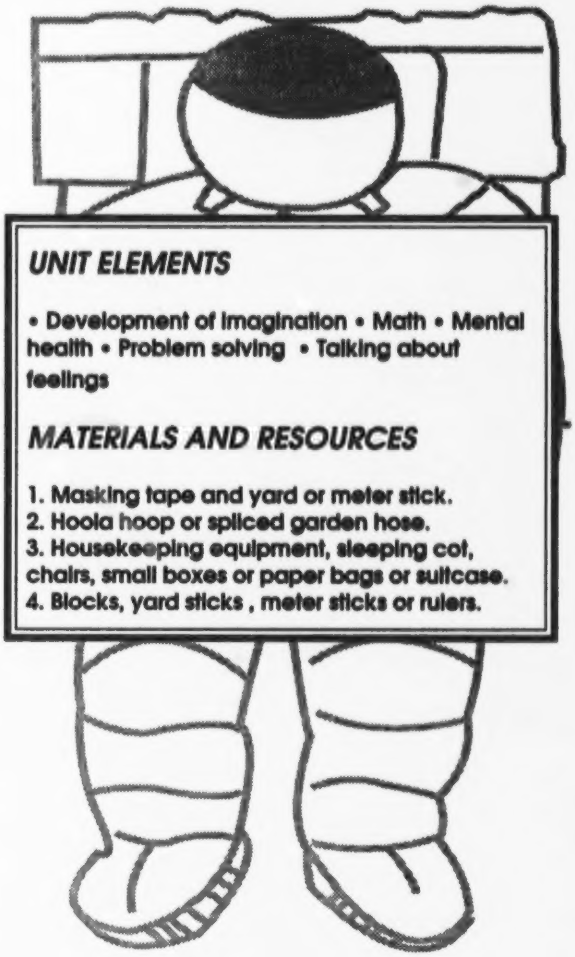
DESCRIPTION

This activity requires patience and cooperation from preschoolers because they are asked to share a small area. Children learn to expect a certain amount of space around them when they play, eat or walk. This activity violates that private area and therefore may make the children uncomfortable. Be sensitive to this and let the children know that you are asking them to be closer to each other than normally they would be. Do not put pressure on any child to participate.

ACTIVITY

1. To begin, make a trapezoid area the size of the shuttle's middeck living area on the classroom floor with masking tape. The dimensions of the middeck are provided with the illustration. If you are working outside, add the cargo bay area behind the middeck; a rectangle 12 feet by 60 feet. Include the area in the children's play. Encourage children to see how many people, or how much equipment, can fit inside it.

2. Form a group circle for seven children. Make the circle much smaller than you normally would. Tell the children today they are going to measure a space shuttle and work in a small area, just as the astronauts do. Tell them that you asked them to sit close together today so they could practice sharing a tight space.

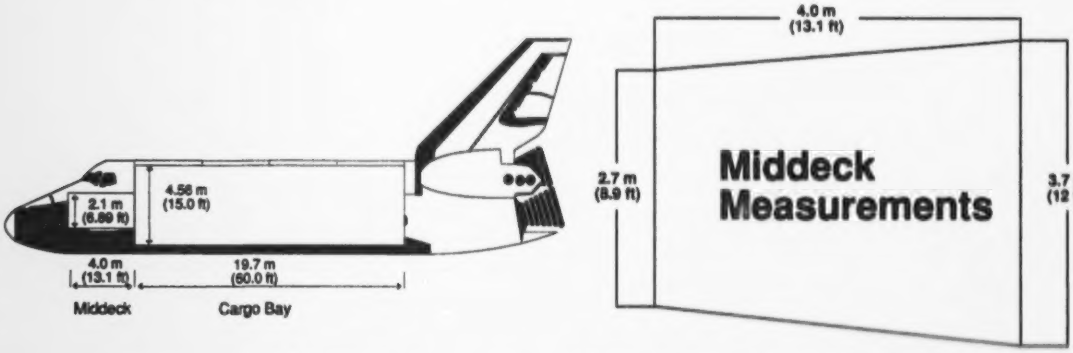


UNIT ELEMENTS

• Development of imagination • Math • Mental health • Problem solving • Talking about feelings

MATERIALS AND RESOURCES

1. Masking tape and yard or meter stick.
2. Hoola hoop or spliced garden hose.
3. Housekeeping equipment, sleeping cot, chairs, small boxes or paper bags or suitcase.
4. Blocks, yard sticks , meter sticks or rulers.



A drawing of the orbiter shows how little of its area is used for crew living space. (YAC Illustration)

Sharing/Measuring

3. Discuss how being in a small area close to other people sometimes makes us feel uncomfortable. Ask them if they have any examples of sharing small spaces with others. Maybe some of them share sleeping space with other children in the family. Do they like how close other children sit to them when they ride the school bus or van?

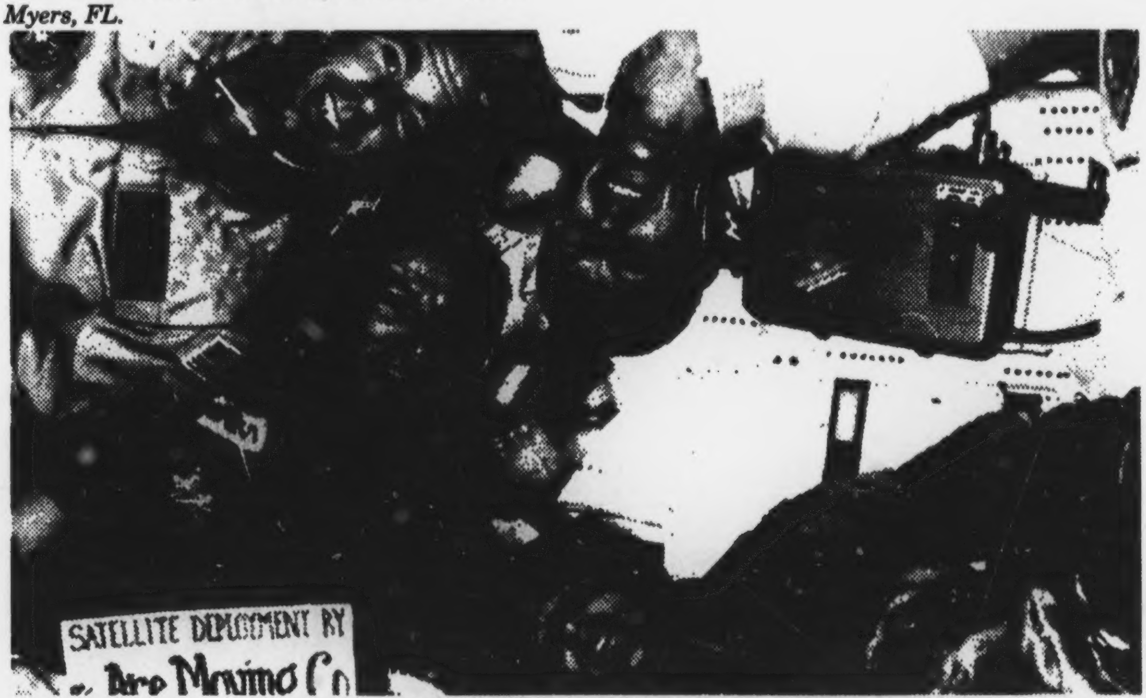
Help children talk about why any examples they mention bother them. (Avoid any traumatic situations which children may have had. These experiences should be dealt with differently.) Tell them that astronauts feel the same way when they are in the space shuttle, but they learn to work and play together and not let the closeness bother them too much.

4. Ask some children to get inside a hoola hoop with you, or splice together a section of garden hose if a hoola hoop is not available. Tell them that they are going to practice walking together in a tight area. Ask them to cooperate and walk together in the same direction.
Idea submitted by Lee County Head Start, Fort Myers, FL.

Pretend that you are traveling in the middeck of a space shuttle. Let one child choose some object in the classroom to "rescue." Walk to it as a group. Ask one child get out and pick up the damaged "satellite" and bring it on board.

Talk about how the children felt about walking together in a crowded space. Perhaps they were afraid of falling or wanted to walk slower or faster or could not see where they were going. Keep a record of their comments and later make an experience story together.

5. Take the children inside the previously taped middeck area. Explain to them that seven astronauts may live in this small area for as long as 30 days. Astronauts eat, sleep and work in this area. Ask children if they want to pretend to live in this tight space. Help seven children bring pieces of housekeeping equipment, such as a refrigerator and sink within the confines of the middeck. Add a sleeping cot and perhaps two chairs.



The crew of STS-5, Columbia float around the mid-deck. (NASA Photo)

Sharing/Measuring

Suggest to children that they play astronaut within the area. Some may want to use the Experiment Box; another may take a nap. Let a couple of the children prepare a meal. Perhaps they all may eat a snack in the middeck. Limit the play to seven children at one time.

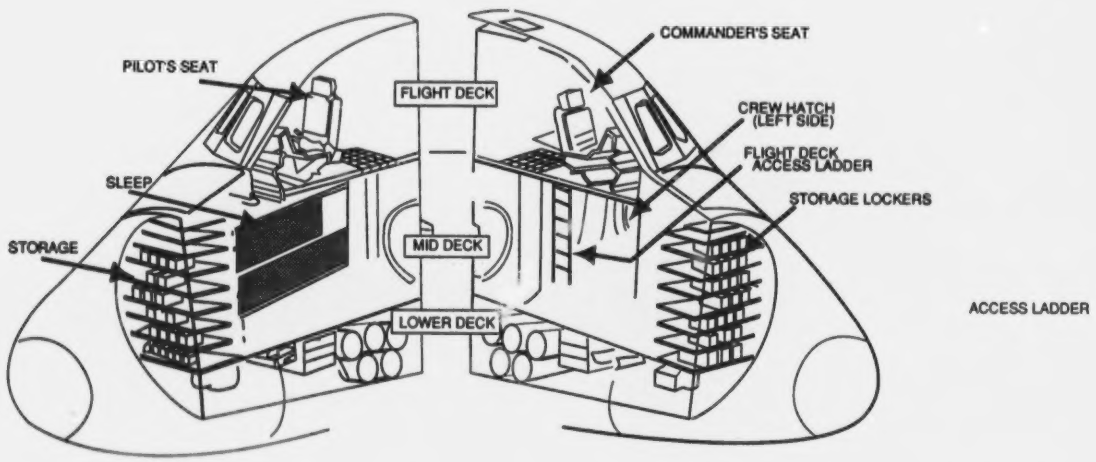
6. Remind children that astronauts are allowed to take personal belongings into space with them. Ask children if they want to take some of their favorite things from preschool with them in the middeck. Caution children that there is only room for small items on board. They may take their personal Space Box. Have some small boxes and paper bags available and maybe a suitcase from housekeeping for children to pack and take on board.

If the area becomes too crowded, ask children to decide what should be taken off the middeck. Let children play with the objects they brought on board. If the area becomes too congested because of their play, ask children for suggestions to solve the situation.

7. Ask children how big they think the middeck area is. Ask them to compare it to their kitchen or bedroom at home or to the bathroom at school. Ask them if the area is bigger or smaller than their car or school bus.

Let children practice measuring things in the classroom if they want. Supply them with yard or meter sticks, or rulers. Accept the terms they use for units of measurement. Ask them to compare two things by telling each other which is bigger and which is smaller.

Together measure the area with a yard stick. Let the children use their unit blocks and help them measure the middeck that way. Tell the children there are other less accurate ways to measure. Show them how to measure heel-to-toe, counting steps. Show them "big steps" and how to count as they go. Use hand lengths to show them another way to measure. Be sure to keep a tally count of the numbers of blocks, steps or hand spans. Perhaps a child could tally with hash marks, one for each block, then count them afterward.

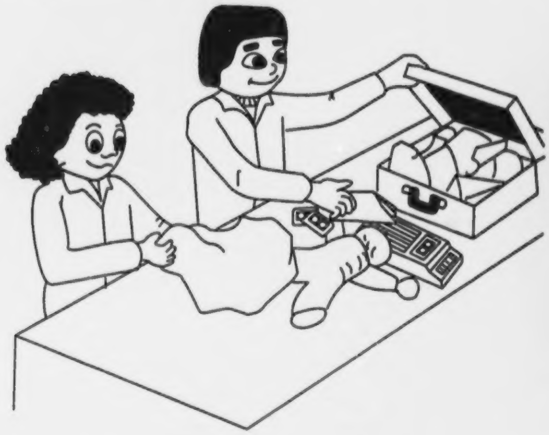


A cut–away drawing of the orbiter shows details of the mid-deck area. (YAC Illustration)

Sharing/Measuring

BACKGROUND NOTES

The shuttle crew consists of two to seven persons. They have two living areas in the front of the shuttle. The upper level is the flight deck—the control area or cockpit—where the pilot and the mission commander work. This deck also has crew stations (controls) for experimental and mission-related activity. When crew members are not on duty, they live, eat, sleep and use the bathroom downstairs in the area called the "mid-deck." In back of this "living" area is the huge cavity called the "cargo" or "payload" bay. This is where satellites are kept for launching or brought in for repair. This is also where the Spacelab, a special laboratory for scientists, is placed.



Kim and Mario carefully choose the things they will take with them on their spaceflight, from "The Youngest Astronauts" storybook. (YAC Illustration)

Astronauts Sullivan and Ride show off their "bag of worms", actually springs, straps and other fasteners used to restrain astronauts while they sleep. (NASA Photo)

NOTES

Sharing/Measuring

The Family Shuttle
NASA
United States

BACKGROUND NOTES

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ACTIVITY

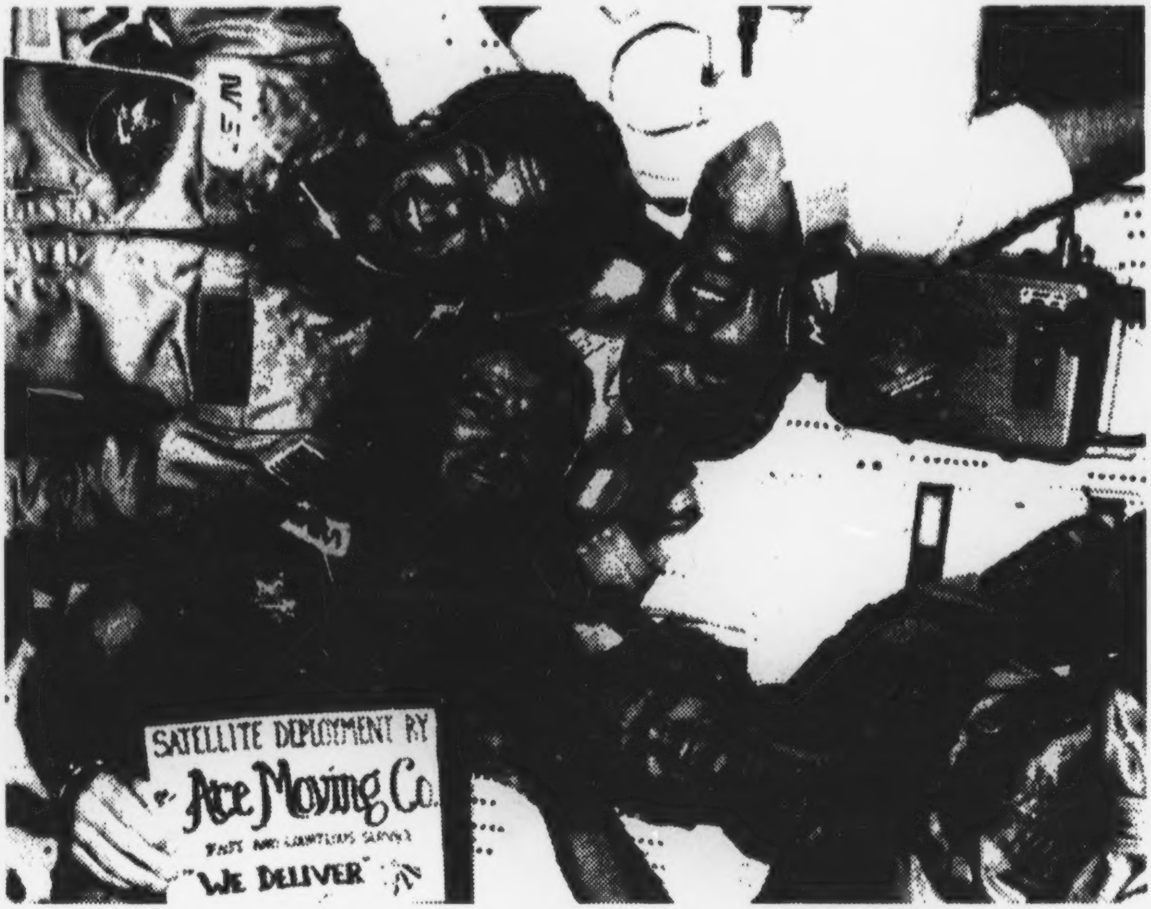
Children learn to expect a certain amount of space around them when they play, eat, watch TV or walk. In school, children have been practicing how to get along with each other in very small spaces. They are learning that astronauts aboard the space shuttle work, eat, relax and sleep in very crowded areas. These activities help extend what the children are doing in school and make the experiences more personal.

Ask family members to share some of their experiences of being uncomfortable because they did not have enough room. Four children riding in the back seat of a compact car or an adult riding in a crowded elevator are a couple of examples.

Astronauts Sullivan and Ride show off their "bag of worms", actually springs, straps and other fasteners used to restrain astronauts while they sleep. (NASA Photo)

Sharing/Measuring

Ask them how they felt and if they did anything about it. Make a list of everyone's examples and see if family members can offer constructive suggestions.



The crew of STS-5, Columbia float around the middeck. (NASA Photo)

Want To Give Your Children More Space To Grow?

Ask family members to sit very close to each other while watching television. Observe how long family members can stay this close. Discuss what made them feel uncomfortable. Explain that all of us learn to expect a certain amount of space around us no matter where we are or what we are doing. This is natural. But when that much space is not available, we have to learn to cooperate and get along as best we can.

Insulation Of Spacesuits

DESCRIPTION

This activity exposes children to variation in temperatures through tactile experiences and helps them understand how we adapt to different temperatures.

Parents may help extend this activity by making children's spacesuits for the classroom. McCall's pattern #2888 works well as a basic pattern. Velcro in place of buttons and additional leg and side pockets for holding tools are suggested.

McCALL'S
2888
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4-5-6
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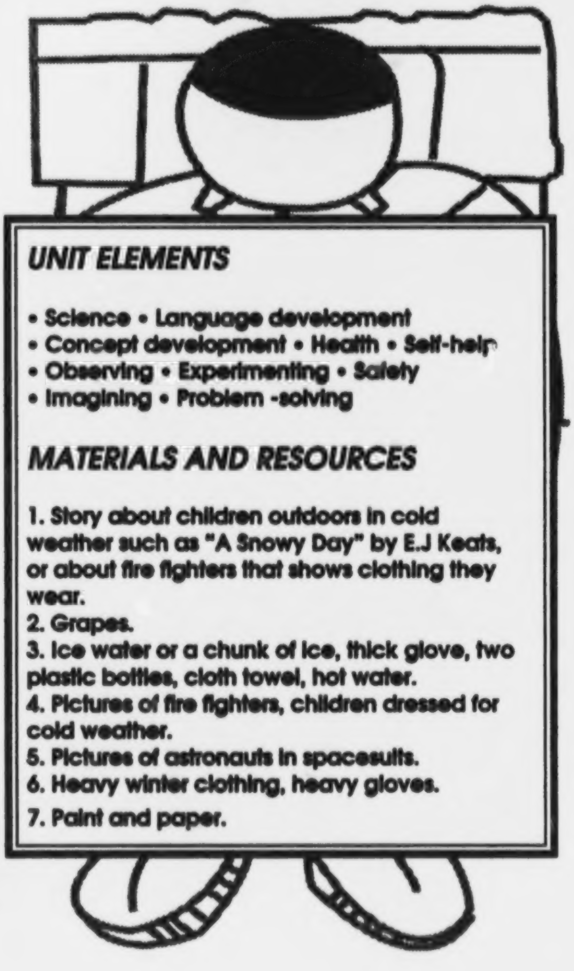
The above pattern can be used to make a spacesuit. (McCall's Illustration)



UNIT ELEMENTS

- Science • Language development
- Concept development • Health • Self-help
- Observing • Experimenting • Safety
- Imagining • Problem -solving

MATERIALS AND RESOURCES

1. Story about children outdoors in cold weather such as "A Snowy Day" by E.J Keats, or about fire fighters that shows clothing they wear.
2. Grapes.
3. Ice water or a chunk of ice, thick glove, two plastic bottles, cloth towel, hot water.
4. Pictures of fire fighters, children dressed for cold weather.
5. Pictures of astronauts in spacesuits.
6. Heavy winter clothing, heavy gloves.
7. Paint and paper.

ACTIVITY

1. Read a story about children outdoors in cold weather, such as "A Snowy Day" by E.J. Keats. Read a story about fire fighters that shows clothing they wear to protect against heat and flames. Show the class pictures of children in winter snowsuits, gloves and caps, especially if they live in an area of the country where this is not a part of their own lives.

Insulation Of Spacesuits

Explain to children why these outfits are worn. Show the children some pictures of people in bathing suits and ask why these people are not wearing snowsuits.

Explain to children that there are many times when we wear clothing to protect ourselves. Sometimes it is too cold to go outside without a jacket or coat. At other times, it is too warm outside and all we want to wear are shorts. Our bodies have to stay just right or we feel too cold or too warm. Talk with children how they dress to go outside when it rains and why.

2. Ask children if they want to experiment with hot and cold temperatures. Take some refrigerated grapes, let each child pick one and ask children to taste them. Ask if they are warm or cold. Repeat the same exercise with grapes at room temperature. Ask children to discuss the difference.

Explain to the children that often the same object can be hot and cold at different times. The Earth's surface is this way.

Talk about other things they know which can be hot and cold, such as the inside of a car or bus seats or the metal slide in the playground. How do they deal with those situations?

3. Hold up a glass of ice water (or a chunk of ice made from an empty milk carton). Ask children how they think this will feel to them. Let them put their right hand around it for half a minute, then touch their cheek. Ask them if their hand feels hot or cold on their cheek. Put a large thick glove on the children's left hand and repeat the activity. Ask them how the gloved hand feels. Encourage them to try the ice with bare right hand and gloved left hand again. Talk about what made the difference.

To demonstrate insulation against heat, use a plastic bottle full of hot water and wrapped in a cloth towel and compare it to a similarly fixed plastic bottle not wrapped.

4. Introduce the word, "insulation," to them. Tell them the glove (or towel) was insulation, or protection, against the cold glass or hot bottle. Show pictures of fire fighters, children dressed for cold weather and other examples that were used earlier. Tell children that the clothing is insulation against heat and cold.

A astronaut in his insulated spacesuit remains cool in the hot and cramped cabin of an early Gemini mission. (NASA Photo)

Talk about items other than clothing which are insulators. Thermos bottles and vinyl lunch sacks, refrigerators and freezers are insulators with which children are familiar.

5. Show children pictures of astronauts in spacesuits. Ask children why the astronauts are wearing such bulky suits. Discuss how it may be very, very hot in space or very, very cold. Astro-

Insulation Of Spacesuits

nauts must be protected from these extreme temperatures. Talk about the thickness of the spacesuits and the gloves. Tell them that the bulkiness makes it difficult to work in space. Show a picture of astronauts helping each other into their suits because it is hard to suit-up alone. Ask children if they have ever needed help getting dressed and why.

6. Suggest children pretend to dress for outer space. If available, let the children experience dressing in heavy winter clothing. Padded snowsuits and all the accessories provide a good experience especially in climates where children are not likely to experience the need for such clothing. Old fur coats or heavy cloth coats also may be used. Supply heavy gloves and helmet-style hats.

Let children help each other as they dress for the extremes of outerspace. Ask children how they feel wearing the heavy clothing and allow them to try some fine motor activity to experience the difficulty of working with bulky clothes. After play, ask children to share how they felt as they were dressing and any frustration they had because of the bulky clothes and accessories.

7. Ask children to draw their own spacesuits and supply them with paint and paper. Discuss the artwork if they wish.

BACKGROUND NOTES

The spacesuits worn by astronauts when they are out of the spacecraft are much more complicated than this activity suggests. They not only insulate the astronauts from the more than 150 degrees below zero cold, but also from much of the deadly radiation from the Sun. Since wearing the heavy spacesuit makes astronauts too warm, however, a type of long underwear with cooling water tubes sewn in is worn underneath the suit. Although the suit and long underwear were carefully designed to be easy to put on, many pictures show astronauts helping each other into them, just as knights of old had to be helped in and out of their armor, and children now have to

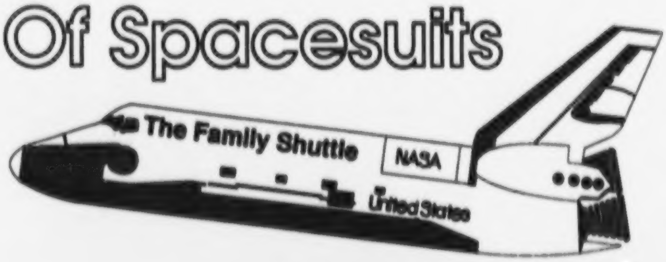
The above photo shows the special tubing, necessary for cooling spacesuits used outside the protective cabin of the shuttle orbiter. (NASA Photo)

Insulation Of Spacesuits

be helped in and out of snowsuits and boots. Shuttle crews normally carry only two spacesuits. Unlike the Apollo program, where each astronaut had two customized spacesuits, now shuttle suits come in small, medium and large with arm and leg extensions to determine individual size and length.

NOTES

Insulation Of Spacesuits



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MATERIALS NEEDED

Several layers of clothes, gloves, hood or helmet.

ACTIVITY

Children in the classroom are discussing insulation and how it protects us from things which are too hot or too cold. They are learning that astronauts must protect themselves from both extremely hot and cold temperatures in outer space. Help your children realize that things in their daily lives also work as insulators against heat and cold.

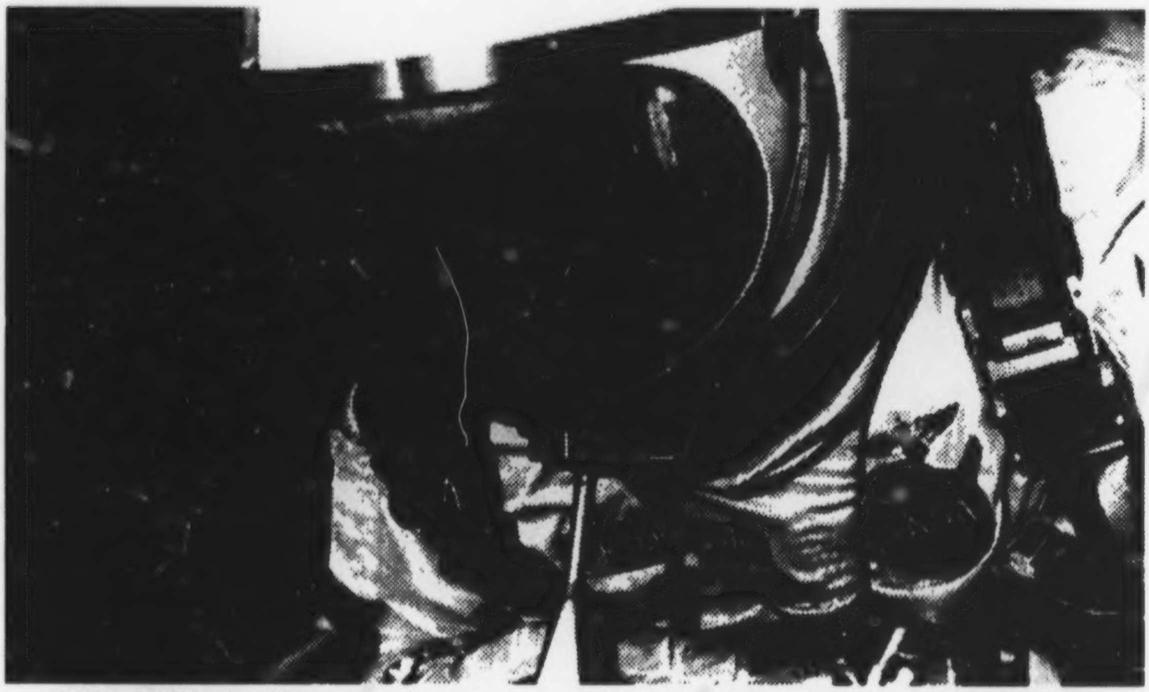
The above photo shows the special tubing, necessary for cooling spacesuits used outside the protective cabin of the shuttle orbiter. (NASA Photo)

Insulation Of Spacesuits

1. When your children get dressed in the morning, talk about the right kind of clothes to wear for the weather. Ask children what they would wear if it is raining or snowing or if the Sun is shining brightly. Suggest to your children that we wear clothing to protect our bodies from too much warmth or coldness. We need "insulation" to keep our bodies at "normal" temperature.

2. When you tuck your children into bed at night, talk about the covers as being insulation which keeps them at "normal" temperature. Explain to them that when people sleep they get a little colder than when they are awake.

Tell your children that dogs, cats and bears have fur that insulates them so they do not have to worry about clothes and blankets.



A astronaut in his insulated space suit remains cool in the hot and cramped cabin of an early Gemini mission. (NASA Photo)

Want To Give Your Children More Space To Grow?

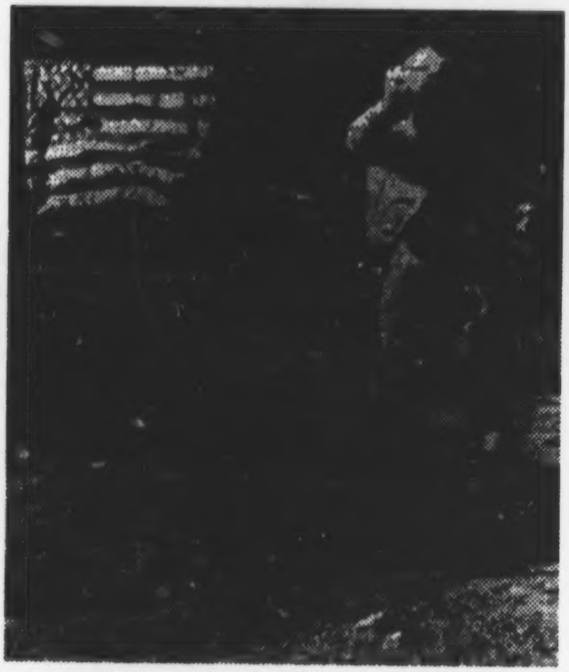
1. Bundle your children in several layers of clothes, including gloves and hood or helmet and let them pretend to be astronauts working in outer space. Talk with them about how difficult it is to play while wearing so much insulation.

2. Find insulators in your home and discuss them with your children. Examples include refrigerators, range doors, the outside of clothes dryers, fiber insulation in walls and around windows, and thermos bottles.

Clothing In Space

DESCRIPTION

This activity helps children think about clothing as protection against various harmful effects of the environment. Its focus, however, is on professions and helps children understand why certain jobs require specific clothing. Although this unit does not emphasize the science or aerospace activities, it helps children realize that many different people, astronauts among them, share the planet Earth and are trying to make this a safe and good place for children.



An astronaut wearing a protective "Moon suit" salutes the American flag. (NASA Photo)

UNIT ELEMENTS

• Language development • Imagining • Classifying • Social relationships • Eye-hand coordination • Art • Problem solving

MATERIALS AND RESOURCES

1. Role-playing hats and other identifying accessories.
2. Story about different professions.
3. Large grocery store paper bags, crayons and art materials to make hats, badges and other identifying symbols.

ACTIVITY

1. Place hats and other job-identifying accessories in the dramatic play area and let children play with them. Represent traditional occupations, such as police officer, physician, construction worker, farmer, fire fighter and astronaut, but include less often thought of workers, such as fast-food worker, cook or mail carrier. Ask the children to pretend to be those people.

Talk with children about how each occupation or profession helps them live better. Construction workers build houses and offices for us to live in and work in. Doctors and nurses keep us healthy or help us get better. Postal workers and telephone workers help us communicate with each other. Grocery store clerks help us get the food we need.

Clothing In Space

Tell them astronauts are helping discover answers to questions people have been asking for hundreds and hundreds of years. Astronauts, like children, ask questions about everything they see in outer space. Astronauts may also be scientists, pilots, doctors, teachers and politicians, among other professions.

2. Read stories to children about different professions which require some specific dress. Discuss why people wear uniforms. Help children understand that some workers wear uniforms to protect them from danger, such as fire fighters and astronauts.

Some uniforms identify people they should know. It is important for us to recognize a police officer by the uniform if we need help. Postal workers and express mail carriers wear uniforms so they do not frightened children when they walk to the front door.

Some people wear uniforms and identification badges to show it is all right for them to be where they are or to allow them to get into a building.

3. List all uniformed jobs, occupations and professions which children know. Encourage children to add lesser known positions or positions they have seen on television such as convenience store workers and airline flight attendants.

4. Let children choose roles to play and supply art materials to make hats, badges and other identifying symbols.

Help children make uniform-like jackets or astronaut spacesuits by supplying large, grocery store paper bags. Cut a line from the top of the bag to the bottom to make the jacket front. Cut a circle for children's necks from the bottom of the bag. Cut smaller circles for arms on narrow sides of the bag. Let children decorate their uniforms. Let the children play in their uniforms and discuss their play with them if they desire.

Technicians in protective clothing prepare the shuttle payload bay for flight. (NASA Photo)

5. Invite community workers to the classroom, either individually or as a Preschool Community Worker Day. Invite uniformed personnel from such places as Civil Air Patrol, Federal Aviation Administration, NASA Resource Centers, local airports, hospitals, police departments, fire stations, parks and fast food chains to discuss their professions with children.

When you invite community workers, provide them with some background on the unit. Most will not have a firm grasp of what children this age can comprehend or what the children already know. Help them understand and they will do a better job in the classroom.

Clothing In Space

6. Invite parents to the Preschool Community Worker Day. They will enjoy the activity and may learn things about the various professions which they did not already know.

BACKGROUND NOTES

Spacesuits are the clothing worn by astronauts when they are working outside the spacecraft during space shuttle flights. Earlier Mercury, Gemini and Apollo programs required astronauts to wear their spacesuits at all times during space travel. Because of the sophisticated environment of the space shuttle, however, astronauts may wear "street clothes" during flights.

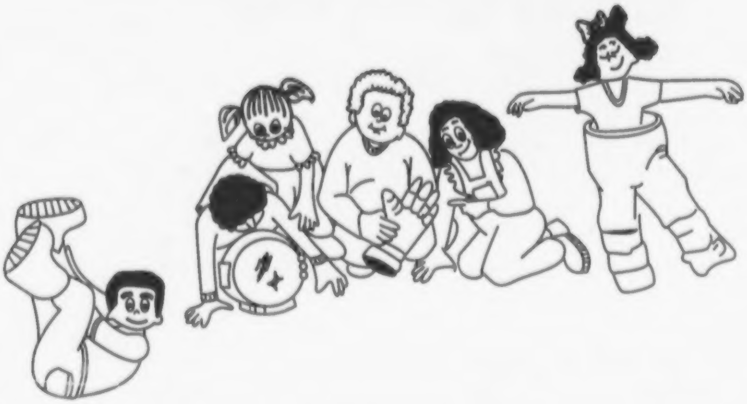
Generally, there are only two spacesuits taken aboard the shuttle. These are used by payload specialists who may work outside the spacecraft once the craft is orbiting the Earth.

Because they are very expensive to manufacture, only three sizes of spacesuits are made- small, medium and large. The arm and leg sections are then custom-made to accommodate the individual sizes of each payload specialist.

Two firemen wearing protective clothing while fighting a fire. (Fire Fighters Association, D.C. Local 36 photo)

Clothing In Space

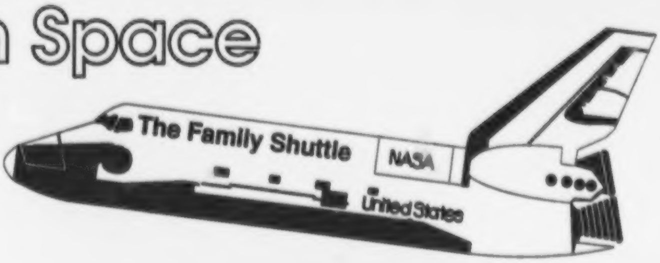
A group of Duval County, Florida preschoolers wear their spacesuits. (Photo from Duval County Head Start)



Children examine the different components which make up a protective spacesuit, from "The Youngest Astronauts" storybook. (YAC Illustration)

NOTES

Clothing In Space



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ACTIVITY

The children at school have been discussing clothing. They learned that clothing insulates our bodies and protects us from too much heat or cold. They are also learning that certain jobs require people to wear uniforms. These activities will help your children understand why some people in your community wear uniforms and how they can help your children.

1. Tell your children about various people in your community who wear uniforms. Help them make a list of any that they know, such as a doctor, a nurse or a bus driver. Ask your children if they know why people wear uniforms. Help them understand that some professions wear uniforms to protect them from danger, such as fire fighters or astronauts.

An astronaut wearing a protective "Moon suit" salutes the American flag. (NASA Photo)

Some uniforms identify people they should know. It is important to recognize police officers by the uniforms they wear, if the children need help. Postal workers and express mail carriers wear uniforms, for instance, so they do not frighten children when they walk to their front doors.

Some people wear uniforms and identification badges to show it is all right for them to be where they are or to allow them to get into a particular building.

Clothing In Space

2. Take your children for a walk on a busy street. Let them point out various uniformed people they see along the way. If your children wish, let them talk with the uniformed people. Later, talk over with them what these people do for a living and how they help your children.

MATERIALS NEEDED

Pencil and paper.

Technicians in protective clothing prepare the shuttle payload bay for flight. (NASA Photo)

Want To Give Your Children More Space To Grow?

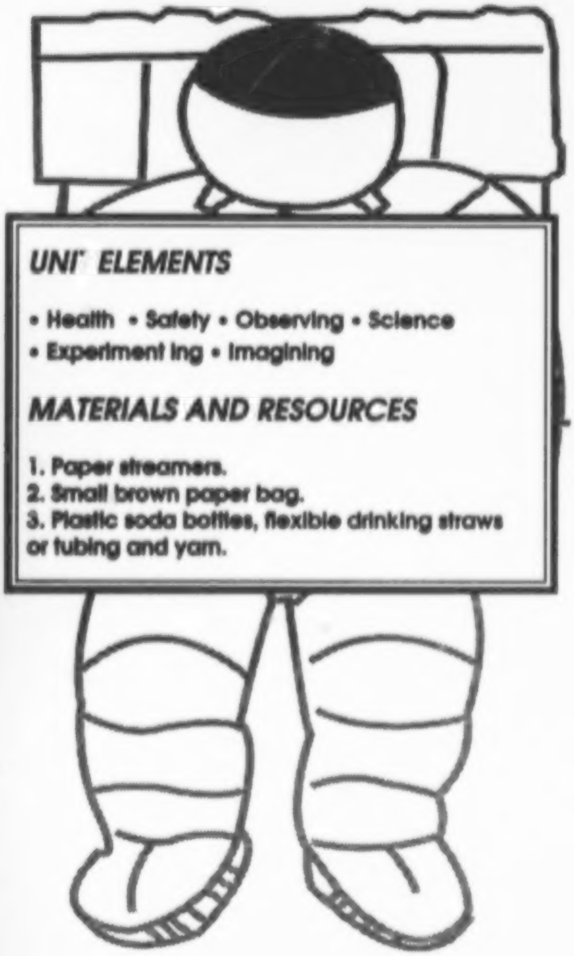
Take your children for another walk. This time, concentrate on professions which only wear a partial uniform or no uniform at all. At a building site, for instance, your children may see construction workers with hard hats and tools; perhaps telephone workers are installing cable lines. Walk to a grocery store where workers may wear aprons and hats to identify themselves or to a fast-food restaurant where uniforms are worn. While you are along, ask your children if they want to talk with these people to find out what work they do. Discuss what the children discover.

Breathing In Space

DESCRIPTION

Air is invisible and an abstract idea for preschool children. Therefore, it is very improbable that they will understand air as a concept before or after this activity. They can, however, experience effects of air through breathing and as wind. They may begin to understand that air is necessary to sustain life.

An astronaut wearing a portable life–support system works in space. (NASA Photo)



UNIT ELEMENTS

• Health • Safety • Observing • Science
• Experiment ing • Imagining

MATERIALS AND RESOURCES

1. Paper streamers.
2. Small brown paper bag.
3. Plastic soda bottles, flexible drinking straws or tubing and yarn.

ACTIVITY

This unit concentrates on air as something children breathe. A unit in "Traveling In Space" focuses on air as shown through wind movement. "Clouds," a unit in "What's in the Sky?," also provides activities with air movement.

1. Ask children if they know what it means to "hold your breath." Demonstrate this and ask children to practice it a couple of times. Ask children to hold an opened hand over their chest as they breathe in and exhale deeply. Discuss

with them the chest movement they experienced. Tell them that something invisible— air, was going in and out of their bodies. Let them know that without air to breathe, we could not live.

2. Give children paper streamers to hold in front of their opened mouths. Let them exhale with the object in front of them, after taking a deep breath. Tell them that air from their bodies made the object move.

3. Tell children you are going to show them how air moves in and out of their bodies. Blow up a balloon and release the air slowly. Blow a streamer with the escaping air just as they had previously done.

4. Give each child a small, brown, paper lunch bag and a straw. Tell them to cup the bag around the straw. Ask the children to blow up the bag through the straw and squeeze the top of the bag to keep their air from escaping. Explain to them that it is their air inside the paper bag. Let the children experiment with the inflated bags. Squeeze the bottom of the inflated bags to let them feel their air as it rushes through the straw.

5. Tell children that in outer space there is no air to breathe. When astronauts travel in space, they have to take their air with them. Sometimes they use tanks that act the same way the balloons did. Fire fighters sometimes use tanks of air, too, when they fight a fire because there is no good air for them to breathe.

6. Supply children with plastic soda bottles and a flexible straw to make pretend breathing tanks. Fasten air tanks with string or yarn straps and loop over children's backs or simply allow children to carry their oxygen tanks in their arms. Connect small tubing or flexible straws to the

Portable air supply systems are used by fire fighters during a training exercise. (NASA Photo)

Breathing In Space

soda bottles. Punch small holes in the soda bottles so children may breathe effortlessly. Ensure that children do not share straws or tubing. Let them play outer space with their air tanks. Save the tanks for ongoing play in the dramatic play or block area.

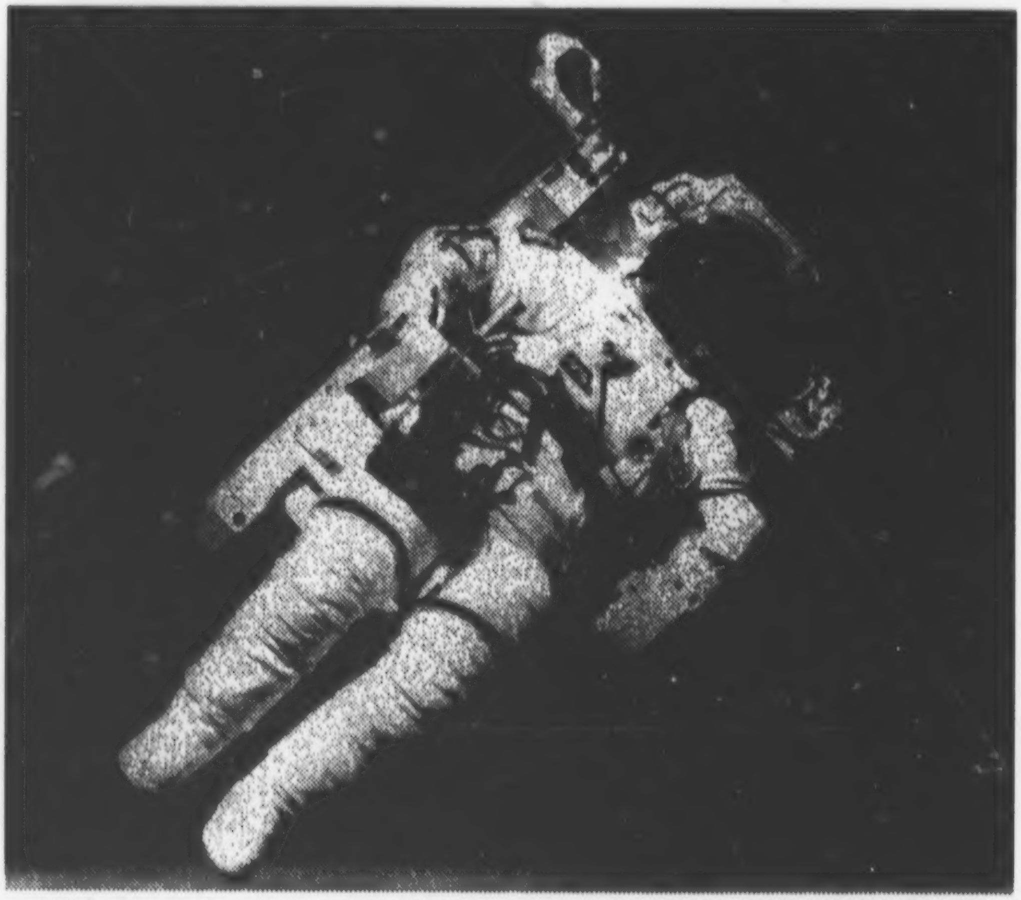
7. Visit a firehouse with the children. Ask the fire fighters if the children may look at and try on (if the children wish) oxygen equipment that is used for breathing in smoke-filled areas.

If scuba diving is done in your area, visit a shop that sells equipment and examine the breathing gear with the children.

BACKGROUND NOTES

Usually we do not think of air as having weight or substance, but it has both. Air contains molecules of nitrogen (mainly), oxygen (important to us) and several other gases, such as carbon dioxide.

Luckily for us, gravity is strong enough to hold a layer of these gases close to the Earth so that we may breathe them. In the emptiness of space, there are very few molecules of these gases and breathing is impossible.



Astronaut McCandless riding an MMU, which includes an oxygen supply system, moves freely in space. (NASA Photo)

Breathing In Space

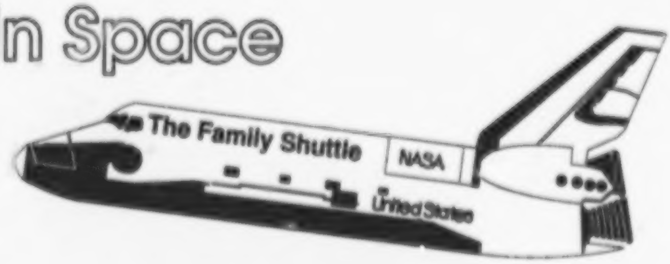
On board the space shuttle (and Spacelab when it is in space), large tanks supply Earth-like air. To go outside, astronauts get into the spacesuit which has its own supply of pure oxygen to breathe.

When astronauts are working outside the shuttle and using the little jet-propelled Manned Maneuvering Unit (MMU) to help them get around, they are supplied with seven hours of breathable air. For safety reasons, astronauts usually stay tethered or tied to the spacecraft while they work on shuttle payloads or other "outside" projects.

NOTES

A fire fighter stands fully outfitted wearing and Air–Pac, portable air supply. (Fire Fighters Association, D.C. Loacal 36 photo)

Breathing In Space



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Portable air supply systems are used by fire fighters during a training exercise. (NASA Photo)

Breathing In Space

ACTIVITY

In the classroom, your preschooler is learning that astronauts must take their own air with them in space. They have to do this because space does not have the right gases to make the air we breathe on Earth. This is hard for preschoolers to understand because they can not actually see air. Help your children begin to think about air and breathing by working on the following activities with them.

1. Talk with family members about people needing air for breathing. Discuss dangerous situations when air is not available. During a fire is a good example. Talk about how you need to crawl on the floor in a smoke-filled room because that is where fresh air stays during a fire.

Practice a fire drill in your home with your family. Telephone your local fire department for proper home evacuation procedures.

2. Talk about being careful in water so that you do not get into a situation where you cannot breathe. If you are present with your children and you do not feel it is dangerous, let them hold their breath under water while swimming or taking a bath. Learning when to hold your breath and when to breathe normally is a survival skill for children.

MATERIALS AND RESOURCES

Two paper towel tubes or empty egg carton, string or yarn.

Astronaut McCandless riding an MMU, which includes an oxygen supply system, moves freely in space. (NASA Photo)

Want To Give Your Children More Space To Grow?

Children are learning about Portable Oxygen Supply Systems (POS) used by astronauts at certain times in outer space. Help your children make and play with pretend POS's.

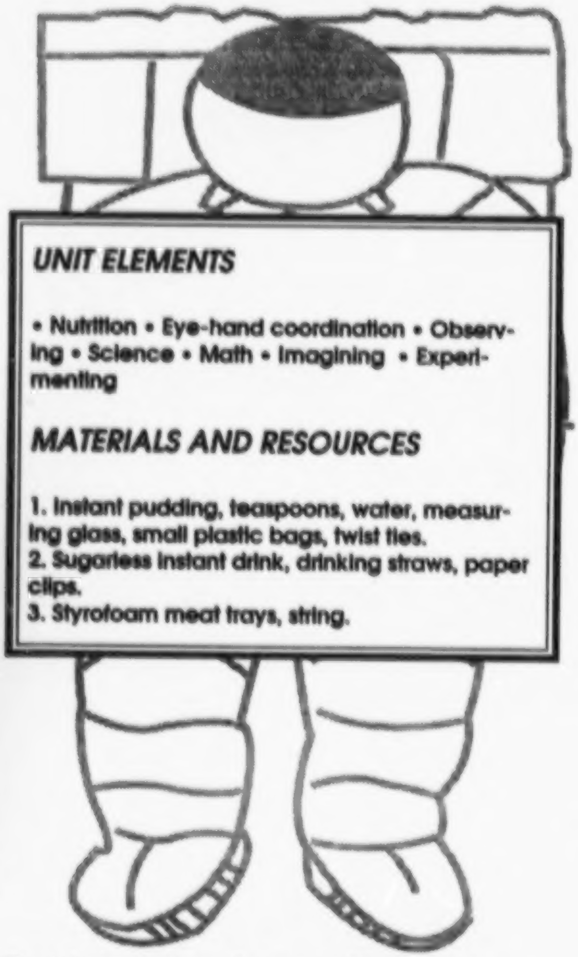
a. Take two paper towel tubes or empty egg cartons and fasten them together.
b. Make shoulder straps for the backpacks from string or yarn.
c. Let your children use their imagination to decorate their portable oxygen supply systems.
d. Help children put on the backpack and encourage them to pretend to be astronauts in outer space. Perhaps they could pretend to collect Moon rocks or explore Mars in the backyard or neighborhood.

Eating In Space

DESCRIPTION

Food preparation and eating in outer space have come a long way since the early Gemini and Apollo flights. In the space shuttle now, astronauts enjoy meals with few restraints. Weightlessness and limited storage capability in the shuttle present only a few differences from eating on Earth. This activity draws attention to those differences. Have fun with this and other food-related units, but remind children that meals in space are designed with nutritional value as well as astronauts' food preferences in mind.

A NASA technician drinks orange juice in a Gemini spacecraft. (NASA Photo)



UNIT ELEMENTS

• Nutrition • Eye-hand coordination • Observing • Science • Math • Imagining • Experimenting

MATERIALS AND RESOURCES

1. Instant pudding, teaspoons, water, measuring glass, small plastic bags, twist ties.
2. Sugarless instant drink, drinking straws, paper clips.
3. Styrofoam meat trays, string.

ACTIVITY

1. Talk with children about the last meal they ate. Ask them if they think they could eat the same thing in a space shuttle or on the Moon. Explain that it would be difficult for helmeted astronauts to eat on the Moon because they have to breathe and eat at the same time. There is no air to breathe on the Moon. But inside the space shuttle where astronauts do not have to wear space helmets, they can eat almost the same way they do on Earth.

Explain to children that everything must be fastened down in the shuttle or it floats away. This is true for food too. (Surface tension of food keeps the molecules of food together when it is served on trays, however.)

Tell children that to save storage space and keep down the space shuttle's weight, astronauts take a lot of dried food with them. Explain that dried food means the water in the food has been taken out. We need to put the water back in before we eat the food. Maybe the children can name some dried powders, such as milk or potatoes, that they have seen someone "reconstitute."

Eating In Space

2. Ask children if they want to prepare and eat a snack like astronauts ate years ago. Make instant pudding with the children. Be sure that all parts of the project are visible to children. Let them help measure the pudding with teaspoons and pour water into a measuring glass before the two ingredients are combined. Place two or three spoonfuls of pudding in small plastic bags for children. Twist-tie the bag closed and snip a corner so children may squeeze the pudding into their mouths.

Let children sit in their spacecraft to enjoy their instant snacks. When they have finished, talk about eating from a plastic bag.

3. Let children put some additional instant pudding powder into plastic sandwich bags and place them in a safe place. Later they may retrieve and reconstitute it. Help them individually make pudding from the bag of powder.

4. A sugarless instant drink may be fun for children to try as a drinking-in-space activity. Use procedures for making instant pudding, but punch a small hole towards the top of bag and supply a drinking straw. A paper clip near the end of the straw would prevent the drink from floating out of the bag in space. Children can try that also.

5. Show children how astronauts eat with food trays in the shuttle. Provide them with Styrofoam meat trays. Attach string to the end and tie around children's laps. Serve a snack in their trays while they are in flight.

A shuttle crew gathers in the middeck for lunch. (NASA Photo)

Eating In Space

BACKGROUND NOTES

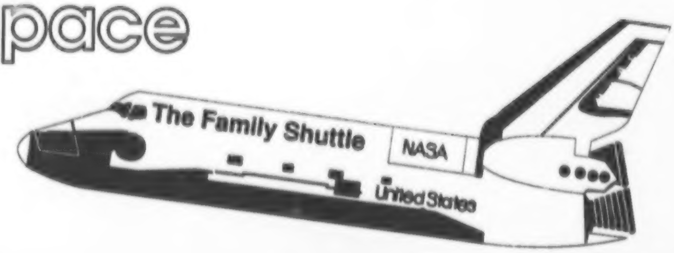
In outer space, weightlessness means that everything is constantly floating, including food. Food needs to be contained. Crumbs can be health hazards. Liquids need special handling. The shuttle is chock full of electrical switches and circuits, and liquids can be dangerous around electricity. So liquids are sealed carefully and drunk through straws. If the liquid were to escape, it would form into globs or spheres due to surface tension. These spheres would float unless they hit something and break into smaller spheres.

Astronauts have dealt with this problem by squeezing food out of tubes directly into their mouths and by eating out of sealed plastic containers snapped into trays which are fastened to their laps. See pictures in "If You Were an Astronaut" and in "Space Shuttle Food Systems." Food that is sticky like stew can be eaten with a spoon. Simply take a spoonful of food and move it in one straight motion into your mouth. Do not try to stop. The spoon might stop, but the food will hit you in the face.

An astronaut, with mouth open, awaits the arrival of a free–floating spoonful of food. (NASA Photo)

NOTES

Eating In Space



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An astronaut, with mouth open, awaits the arrival of a free–floating spoonful of food. (NASA Photo)

ACTIVITY

Children are learning about food which astronauts take into outer space with them. The activities presented in this unit provide the chance for children to work in the kitchen with you. Before you begin these activities, tell your children that to save storage space and keep down the space shuttle's weight, astronauts take a lot of dried food with them on space flights. Explain that dried food means the water in the food has been taken out. Water has to be put back in the food before it is eaten.

1. Ask your children if they want to prepare and eat a snack like astronauts ate years ago during space travel. Make instant pudding with the children. Let them help measure the pudding with teaspoons and pour water into a measuring glass before the two ingredients are combined. Place two or three spoonfuls of the pudding in small plastic bags. Twist-tie the bags closed and snip a corner so children may squeeze the pudding into their mouths. The family may want to sit in the children's home-made space shuttle to enjoy the instant pudding snack.

2. Ask children if they know other items to which water is added before they may be eaten or drunk. Instant potatoes, packaged sauces and sugarless soft drink powders are a few dried items which your children may know. Let them help "reconstitute" some of their examples as additional dried food experiences.

MATERIALS NEEDED

Instant pudding, measuring cup, small plastic bags and twist ties and ingredients for a meal made from dried food.

Eating In Space

A shuttle crew gathers in the middeck for lunch. (NASA Photo)

Want To Give Your Children More Space To Grow?

Plan a complete meal with your children made from dried foods. Shop for the food and prepare the meal as a family activity. Macaroni and cheese is a dish which most children like.

Drying Food

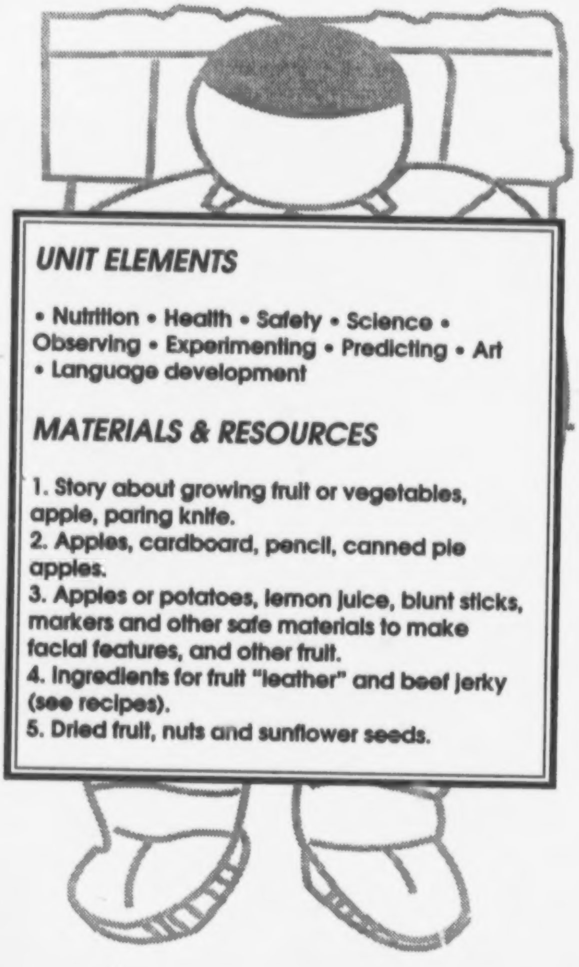
DESCRIPTION

This activity helps children learn that food may change its shape and taste through dehydration and rehydration. They will see that food becomes smaller through the drying process and larger when water is added. Although they will not understand the concept, dried food weighs less and is therefore a valuable food source during space flights where weight and size are crucial factors.

Evaporation is the process of a liquid changing into a gas or vapor. Dehydration is a process of removing water from a substance.

ACTIVITY

1. Read a story to children about growing fruit or vegetables. Discuss the story and talk about fruit and vegetables as valuable sources of vitamins. For instance, show them an apple and share what they know about apples. Cut the apple into thin slices and ask each child to eat a slice or two. Talk about the apple's juiciness. Tell them that water makes the juice.

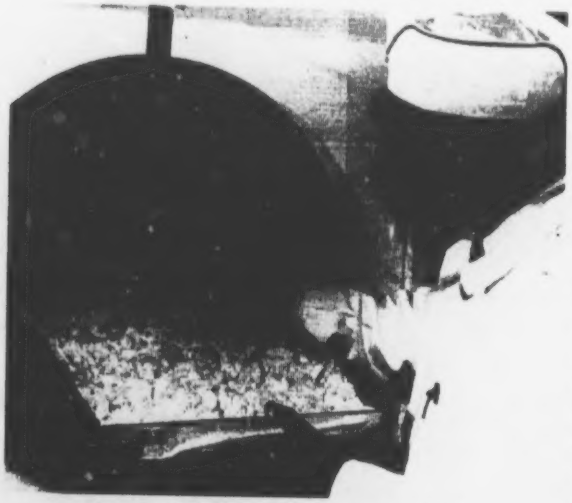


UNIT ELEMENTS

• Nutrition • Health • Safety • Science • Observing • Experimenting • Predicting • Art • Language development

MATERIALS & RESOURCES

1. Story about growing fruit or vegetables, apple, paring knife.
2. Apples, cardboard, pencil, canned pie apples.
3. Apples or potatoes, lemon juice, blunt sticks, markers and other safe materials to make facial features, and other fruit.
4. Ingredients for fruit "leather" and beef jerky (see recipes).
5. Dried fruit, nuts and sunflower seeds.



Eggs being dehydrated for space food. (NASA Photo)

2. Tell them about an experiment to take the water out of apple slices. Let children arrange slices on cardboard. Outline the shapes of the slices on the cardboard with a pencil. Ask children to identify which slice they want to watch as it dries and mark children's names by the slices. Make a second batch for the children to eat later. Protect these slices from insects and dirt by screening them. Place the slices with maximum exposure to heat, such as a radiator or direct sunlight. Allow slices to dry overnight or over a weekend.

Drying Food

Ask children to predict what will happen to the slices. Write down their predictions. Tell the children this is how scientists work. They make a reasonable guess what will happen to something and then they experiment to see if it is true or not. Allow the children to check the apples periodically during the day as they dry. If apples mold instead of dry, share this observation with the children and try thinner slices and more heat next time. Fruit also may be dried in the summer Sun.

BEEF
WITH VEGETABLES
3 oz. hot water
5-10 minutes

A package of beef with vegetables, used during Apollo spaceflights. (NASA Photo)

Drying Food

After the slices have dried, let the children discuss what happened to their slices. Tell them that the first slices were exposed to unhealthy conditions, but let them taste slices from the second batch. Have fresh apples slices available. Let them compare and discuss the two different slices. Introduce terms "evaporate" and "dehydrate" to the discussion.

Tell them that during space flights, astronauts often eat dried food because it does not spoil and it is lightweight. Ask if anyone wants to add water to dried apple slices to see what will happen. Ask for their predictions and chart them for the children to see. Test and taste results, and record these for the children.

Set up a tasting area for comparing three, different, apple preparations. Have three dishes: fresh apples, dried apples and canned apples (usually called pie apples). Let children eat a bit of each. Discuss texture, color, shape and appeal. Chart comments.

3. Ask children if they want to make astronaut puppet heads from apples (or potatoes) and see what happens to them as they dry. Peel apples for children and dip them in lemon juice to retard discoloration. Insert a blunt stick halfway into the apple. Supply markers and other safe classroom materials to make facial features for their heads. If children want, help them make a body for the astronaut from a small paper bag and decorate. Attach the two pieces together for the children. Let them play "Living In Space" with the puppets.

When they have finished, line the puppets up and ask children to predict what will happen to the apple heads. To avoid anxiety when they see the puppets the following day, suggest to children that the heads will shrink and discolor. Discuss the observations with them the next day. Let children play space adventure with their puppets or allow children to take puppets home and share with their families.

4. Let children learn about and taste other dried foods. Make fruit "leather" by pureeing apples or other fruit. Spread it on cookie sheets to dry. See fruit "leather" recipe that follows.

FRUIT LEATHER

2 c. fully ripe fruit (cherries, plums, apricots, peaches, berries, apples, or a mixture of any you may choose)
2 tbsp. honey or sugar (optional)
ground cinnamon, nutmeg, and/or cloves
lemon or orange peel (optional)
raisins (optional)
coconut (optional)
knife, cutting surface, blender, large saucepan, baking sheets, plastic wrap, wooden spoon, nylon net, sunshine, hot plate or range (optional) oven (optional)

Wash fruit in a basin, but do not peel. Cut in large chunks and place in blender. Add honey or sugar and blend 15 seconds. Fruit mixture may be simmered if desired. This blends flavors, especially if you add spices, citrus peel or raisins. Cover baking sheets with plastic wrap (adult help may be needed because it can be very frustrating to handle the wrap). Make sure the wrap extends over top of sheets so fruit mixture does not leak under wrap. Pour fruit mixture onto sheets. Spread evenly with wooden spoon to about 1/8–inch thickness. Set in direct sun to dry until firm and not sticky to touch. (This takes about 12 hours on a hot, dry day.) Keep insects off by covering with nylon net. Leather may also be dried for about four hours in a 150° F oven with the door ajar. When dry, roll and store. Fruit leather keeps frozen or stored in a tightly covered container for six months to a year. This is an excellent snack for field trips or outdoor activities - no mess and no dishes required when eaten.

Recipe from Nancy Wanamaker et. al., "More Than Graham Crackers." Washington, D. C.: National Association for Education of Young Children, 1979.

Drying Food

Help children make beef jerky with the recipe below and compare it to commercially available jerky.

JERKY

1 1/2 - 2 lb. of beef flank steak (or some other lean, tough cut of beef)
1/4 c. soy sauce
1/4 c. Worcestershire sauce
1/2 tsp. pepper
1 tsp. onion salt
1 tsp. salt
1 tsp. garlic powder

Knife, cutting surface, measuring cups, measuring spoons, wooden spoon, large bowl with lid, refrigerator, shallow baking pan with rack, oven.

Adult will probably need to slice steak lengthwise, with the grain, into 1/4-inch strips. Let children measure and combine soy sauce, Worcestershire sauce, pepper, onion salt, salt and garlic powder. Mix with the meat strips in a bowl, cover and refrigerate overnight. Drain meat and arrange in a single layer on a rack set in a shallow pan (to catch the drippings). Bake in a slow oven (150° F) 12 hours until dried. When cool, eat or store in a tightly covered container.

Recipe from Nancy Wanamaker et. al., "More Than Graham Crackers." Washington, D.C.: National Association for Education of Young Children, 1979.

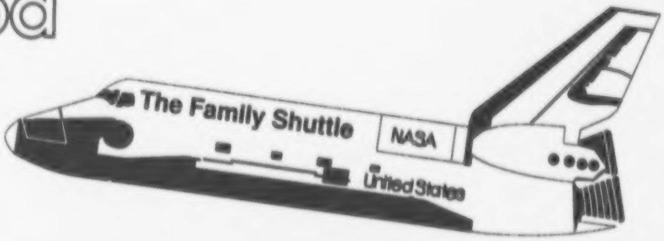
5. Mix dried fruit with nuts and sunflower seeds to make a high protein, high energy snack.

BACKGROUND NOTES

Storage room is very limited on spacecraft. Everything must be as small and light as possible. Dry food takes up less room and weighs much less than moist food, so many dried foods are taken on shuttle flights. Water is added when they are eaten. Also, dry food spoils less quickly than fresh food, which is another reason to use it during space travel. Spacecraft such as the shuttle have no refrigerators in their food area.

NOTES

Drying Food



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BEEF
WITH VEGETABLES
3 oz. hot water
5-10 minutes

A package of beef with vegetables, used during Apollo spaceflights. (NASA Photo)

MATERIALS NEEDED

Peaches, apples or other fresh fruit, paring knife, tray, oven and plastic wrap, ingredients for fruit "leather", beef jerky and pumpkin seeds (see recipe).

ACTIVITY

In the previous unit, children reconstituted or added water to powdered food items to make something to eat. This activity does the reverse, and asks children to observe water being taken out of food, or being dehydrated. Although this reversal process is obvious to adults, for preschool children, these are two different activities and probably have no connection to one another. Be aware of this as your family works through these activities.

1. Tell your children that astronauts in outer space often eat dried food because it does not spoil and it is lightweight. Ask them if they want to perform an experiment to take water out of peaches, apples or other fresh fruit. Cut the fruit into thin slices and let your children taste a slice. Ask them if the fruit is juicy. Suggest that water makes it juicy.

Explain to your children that heat takes water out of fruit. Arrange most of the remaining fruit slices on a tray and place in a very low oven (225° F). Keep a few slices wrapped for later use. Check the drying process periodically and remove when fruit has dried. While the slices are drying, ask your children to predict what will happen to the slices. Discuss their predictions with them.

While the fruit is drying, point out that the oven door is an insulator. (See Family Activity, LIS #9, for details, if needed.) It keeps heat inside the oven and protects people from getting burned. Ask your children what they know about insulation.

Drying Food

FRUIT LEATHER

2 c. fully ripe fruit (cherries, plums, apricots, peaches, berries, apples, or a mixture of any you may choose)
2 tbsp. honey or sugar (optional)
ground cinnamon, nutmeg, and/or cloves
lemon or orange peel (optional)
raisins (optional)
coconut (optional)
knife, cutting surface, blender, large saucepan, baking sheets, plastic wrap, wooden spoon, nylon net, sunshine, hot plate or range (optional) oven (optional)

Wash fruit in a basin, but do not peel. Cut in large chunks and place in blender. Add honey or sugar and blend 15 seconds. Fruit mixture may be simmered if desired. This blends flavors, especially if you add spices, citrus peel or raisins. Cover baking sheets with plastic wrap (adult help may be needed because it can be very frustrating to handle the wrap). Make sure the wrap extends over top of sheets so fruit mixture does not leak under wrap. Pour fruit mixture onto sheets. Spread evenly with wooden spoon to about 1/8–inch thickness. Set in direct sun to dry until firm and not sticky to touch. (This takes about 12 hours on a hot, dry day.) Keep insects off by covering with nylon net. Leather may also be dried for about four hours in a 150° F oven with the door ajar. When dry, roll and store. Fruit leather keeps frozen or stored in a tightly covered container for six months to a year. This is an excellent snack for field trips or outdoor activities - no mess and no dishes required when eaten.

Recipe from Nancy Wanamaker et. al., "More Than Graham Crackers." Washington, D. C.: National Association for the Education of Young Children, 1979.

Want To Give Your Children More Space To Grow?

1. Let your children learn about and taste other dried foods. Make fruit "leather" by pureeing apples or other fruit. Spread it on cookie sheets to dry. A recipe for fruit leather is provided above for your use.

2. Together with your children make beef jerky by following the recipe available from the teacher. Let your family compare this homemade jerky with commercially available beef jerky.

3. Dry pumpkin seeds in the sun or oven and eat as a snack.

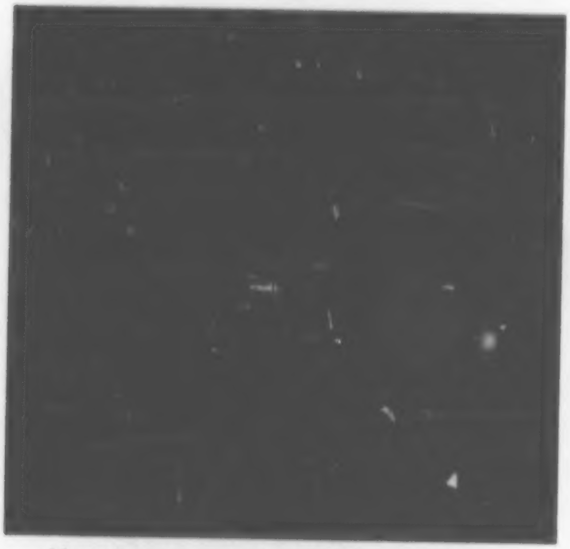
Planning What Food To Take

DESCRIPTION

Children will taste some different foods which foreign astronauts eat in space. Children can plan nutritionally sound meals which they may take with them on a pretend space adventure. This unit presents an additional opportunity to reinforce the idea that many different cultures share Earth.

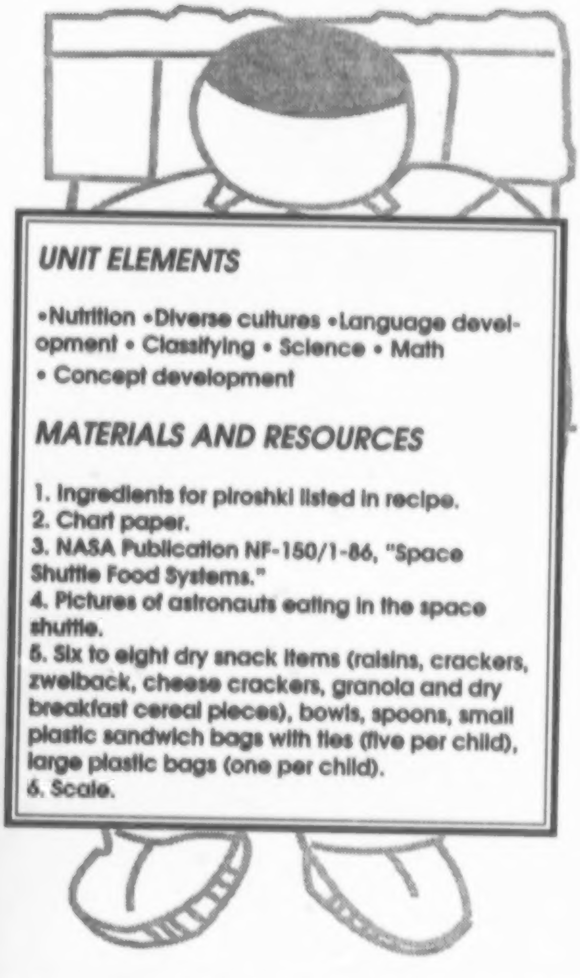
ACTIVITY

1. Make piroshki (filled pastries) from the accompanying recipe(see family section) and serve to the children. Tell children that this is one of the Russian "cosmonauts'" favorite foods while they travel in space. Talk about the taste, smell, texture and shapes of the piroshki.



Meals for a week, for two shuttle crew members. (NASA Photo)

2. Tell children that Russian astronauts are called cosmonauts and that they eat many of the foods that astronauts eat: hamburgers, roast beef and milk. They also eat foods that are different, such as curd, caviar, black currant juice and piroshki. They enjoy soups, especially borscht, a beet soup.



UNIT ELEMENTS

•Nutrition •Diverse cultures •Language development • Classifying • Science • Math • Concept development

MATERIALS AND RESOURCES

1. Ingredients for piroshki listed in recipe.
2. Chart paper.
3. NASA Publication NF-150/1-86, "Space Shuttle Food Systems."
4. Pictures of astronauts eating in the space shuttle.
5. Six to eight dry snack items (raisins, crackers, zweiback, cheese crackers, granola and dry breakfast cereal pieces), bowls, spoons, small plastic sandwich bags with ties (five per child), large plastic bags (one per child).
6. Scale.

3. Ask children to list their favorite foods. Ask if they think it is possible to take these on a space flight. Use a chart with three columns to write their choices: Name/Favorite Food/How to prepare it in spacecraft.

Explain to children that there is a microwave oven on the shuttle. There is no refrigeration on board, although Skylab, where astronauts experimented for several months, and future plans for a space station, do have refrigeration units. Use a copy of NASA's publication NF-150/1-86, "Space Shuttle Food Systems", to help

Planning What Food To Take

children decide if their selections may be eaten during space flights.

4. Show children pictures of astronauts eating in the space shuttle and discuss what they see. Tell them that a nutritionist plans very carefully what astronauts eat in space. Foods that the astronauts like and that are nutritional are taken on flights.

Ask children to plan a snack for a five-day space flight.

Choose six to eight dry snack items for a week of school. Quantities of raisins, crackers, zweiback, cheese crackers, granola and dry, non-sugar, breakfast cereal pieces, for example, are good choices. Arrange dry foods in bowls with a spoon in each. Provide each child with five, small, plastic, sandwich bags with ties (or as many as days of school during a week). Encourage children to select different snacks to eat during the next five days. After children secure their snacks, place their choices in individual, large, plastic bags. Identify bags with names, such as "Astronaut Tanya" or "Astronaut Tony," and store in a safe place.

Astronaut Rhea Seddon "sits" down to a meal in the mid-deck. (NASA Photo)

During the Apollo–Soyuz linkup the astronauts exchanged food. (NASA Photo)

During the weekdays, let children select space flight snacks from their large bags.

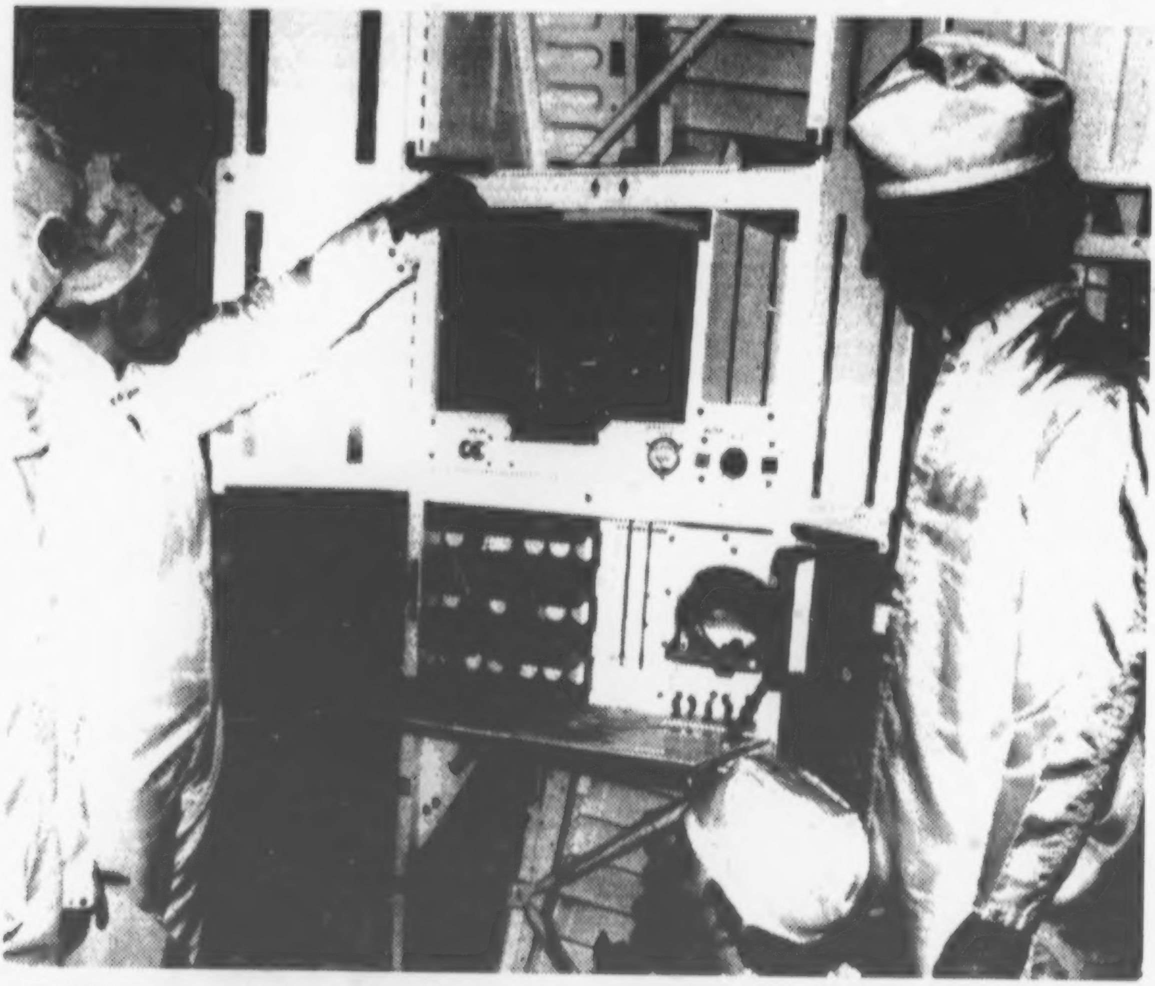
5. Invite a nutritionist or a nurse to discuss nutrition and its relationship to height and weight. Show children their Earth weight by providing a scale and letting them weigh themselves.

Planning What Food To Take

6. With the help of parents, arrange for an Ethnic Space Food Day. Many countries, representing diverse cultures and ethnic backgrounds, have had citizens in outer space. Astronauts from Canada, West Germany, Switzerland, Italy, Netherlands, Mexico, Saudi Arabia, France and Holland have been among those participating in the American space program. Cosmonauts from East Germany, Rumania, France, India, Czechoslovakia, Poland, Hungary, Vietnam, Cuba and Mongolia have joined in Soviet space flights.

BACKGROUND NOTES

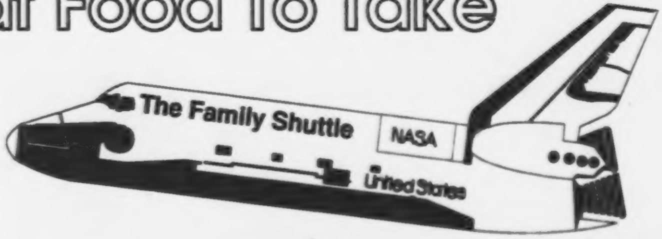
Eating in space is not only a matter of providing proper nutrition but also of providing food that astronauts want to eat and will eat. Some astronauts feel sick for a couple of days when they first go into space, and this makes them feel like not eating. Children who have been car-sick will sympathize with this experience. Astronauts are busy which also makes eating not very relaxed. Every effort is made, therefore, to cater



Technicians complete the installation of a new galley for the shuttle Columbia, making it possible to prepare hot food more easily in flight. (NASA Photo) to astronaut preferences and to make food attractive and tasty. Cultural differences are, of necessity, respected in planning menus; caviar appeared several times on the Soviet menu, for example. Candy, gum, cookies, nuts and dried fruit are among the snacks available. Children might like to know that M&M-type candy and graham crackers are among the snacks. See "Space Shuttle Food Systems" for lots of interesting details.

NOTES

Planning What Food To Take



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MATERIALS NEEDED

Paper and pencil.

ACTIVITY

At school, children are learning that the food astronauts eat during space travel is very carefully planned by nutritionists on Earth long before flights begin. They are testing some different foods which foreign astronauts and cosmonauts have eaten in outer space. These family activities help your children realize the value of planning ahead. They also expose them to different ethnic and cultural foods.

1. Ask your children if they would like to plan a family meal that could be eaten in outer space.

Astronaut Rhea Seddon "sits" down for a meal in the middeck. (NASA Photo)

Planning What Food To Take

PIROSHKI

Preheat oven to 450° F.

Use biscuit or pie dough. Pat or roll it until thin: perhaps 1/4-inch for biscuit dough, 1/8-inch for pie dough. Cut into 3x3-inch squares or round. Place a filling on each piece of dough, as much as possible and still be able to close piroshki properly. Close by moistening edges, folding over and pinching down with a fork. Place triangles or crescents in a pan. Brush with soft butter. Bake until dough is done, about 20 minutes.

Suggested fillings: cooked hamburger or other ground meat, and cooked seafood filling.

On a sheet of paper mark four columns: soup/salad, meat/fowl/fish, vegetables and dessert. Make sure each family member has a chance to offer a suggestion for each category. Write these down and then discuss which could be eaten in outer space. Keep in mind that dried, canned and freeze-dried foods are good choices for simulating space meals.

Discuss favorite choices and the nutritional value of suggestions. Then let the family decide the menu.

Planning A Family Meal For Outer Space

Family Member	soup/ salad	meat fowl fish	vegetables	dessert
Mom				
Samantha				
Julius				

Want To Give Your Children More Space To Grow?

1. If you have relatives, friends or neighbors whose ethnic background is different from your family's, ask them to talk with your children about their foods which your family may not know about.

2. Ask your relatives, friends or neighbors to tell your children what their favorite food was when they were children. Talk about special foods they ate on holidays.

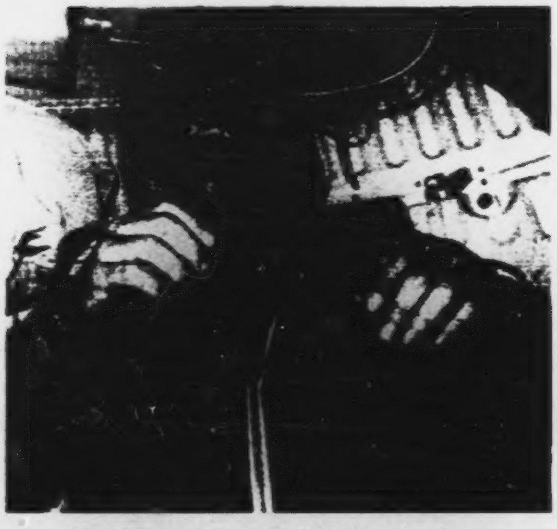
Sleeping In Space

DESCRIPTION

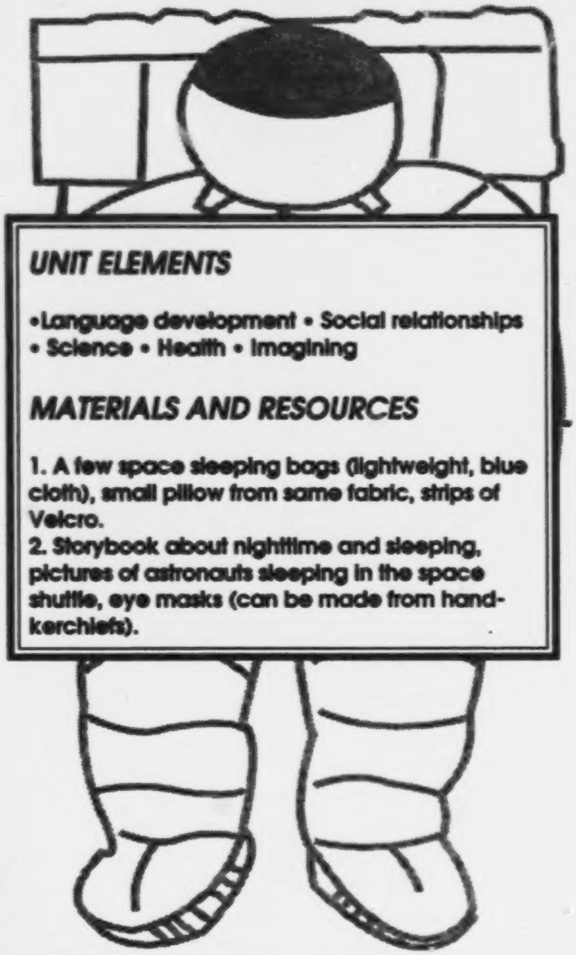
This activity introduces children to the circumstances under which astronauts must sleep. It helps children think about sleeping under unusual circumstances. Children are invited to nap under similar conditions. Ask a couple of parents to help you make a few space sleeping bags for the children before you begin this unit. Sew lightweight, blue cloth sleeping bags about two feet wide by four feet long. Put arm holes near the top. Make a small pillow from the same fabric and attach sleeping bag to the pillow with strips of Velcro on each piece. A less-involved sleeping bag may be made with fabric pieces two feet by eight feet. Fold fabric in half, lengthwise, and fasten sides together with safety pins. Allow space for arms to hang out on the sides.

ACTIVITY

1. Read or tell a story about nighttime and sleeping to the children. Ask them when and why they sleep or take a nap. Ask if any children have used a sleeping bag and when?



An astronaut's arms float freely as he sleeps. (NASA Photo)



UNIT ELEMENTS

•Language development • Social relationships • Science • Health • Imagining

MATERIALS AND RESOURCES

1. A few space sleeping bags (lightweight, blue cloth), small pillow from same fabric, strips of Velcro.
2. Storybook about nighttime and sleeping, pictures of astronauts sleeping in the space shuttle, eye masks (can be made from handkerchiefs).

2. Show them pictures of astronauts sleeping in the space shuttle. Let them discuss the pictures. Point out that astronauts may sleep in any direction or standing up because they float. That does not bother them at all, but it is very different from sleeping on Earth.

3. Ask children why they think there are no beds. Explain that there is no room for bunks or beds in the orbiter. Tell children that astronauts sleep in the same room where they eat and work. Ask them if they would like to sleep and play and eat in the same room all the time.

Sleeping In Space

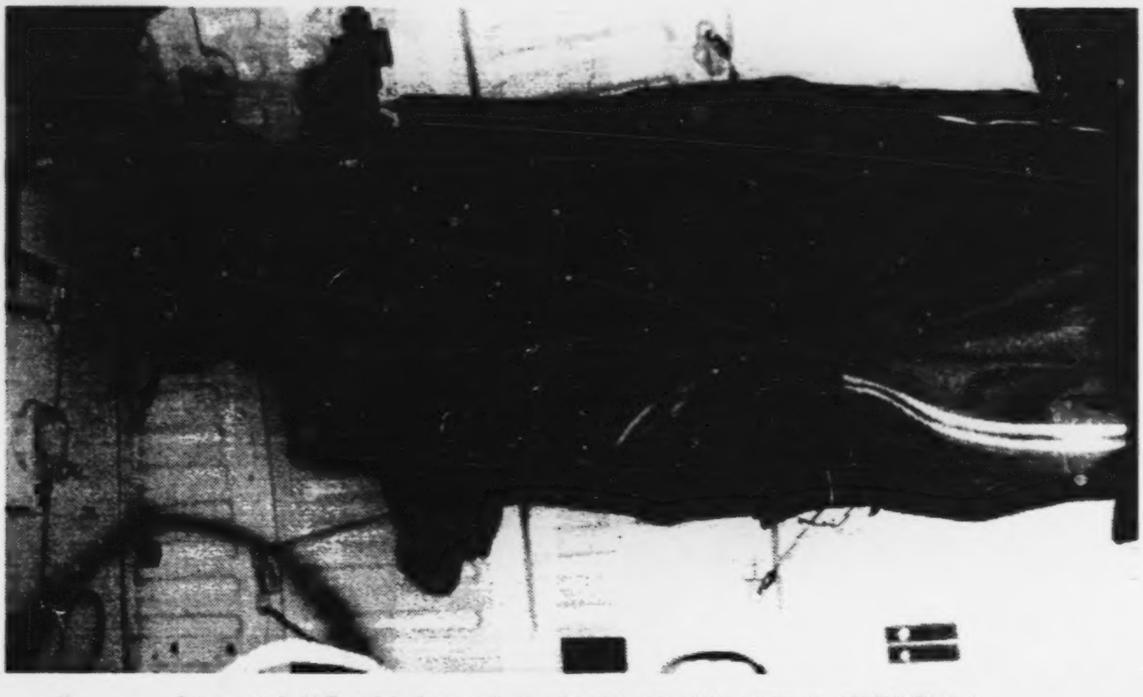
4. Tell children that because the space shuttle circles the Earth every 90 minutes the astronauts have lots of days and nights. If you can darken the classroom, turn the lights on and off a few times at 15-second intervals to indicate day and night at accelerated speeds for the children. This makes it difficult to sleep, and astronauts wear eye masks to shade their eyes. Show the children an eye mask or make one from a handkerchief and let children experiment with it.

5. Tell the children that many times astronauts have to sleep in the same area where others are working because someone is working most of the time during space flights. Astronauts who are working while others are sleeping must be considerate and quiet or they will disturb those sleeping.

6. Ask children if they want to sleep in a pretend spacecraft with space sleeping bags and eye masks. Have three children crawl into the sleeping bags and put on eye masks, while others in the classroom play astronaut and perform experiments quietly around them.

7. Ask the sleeping astronauts to think about flying in the spacecraft and dream about all the bright stars they have seen on their journey. Ask them to count or give names to as many stars as they can while they fall asleep. Ask the working astronauts to be as quiet and considerate as they can while they work. They do not want to wake up the sleeping astronauts.

When the sleeping astronauts finish napping, ask them what they were thinking and how difficult it was to sleep. Make sure all children have a chance to play both roles.



Astronaut Judy Resnick sleeps, strapped to the side of the middeck. (NASA Photo)

Sleeping In Space

BACKGROUND NOTES

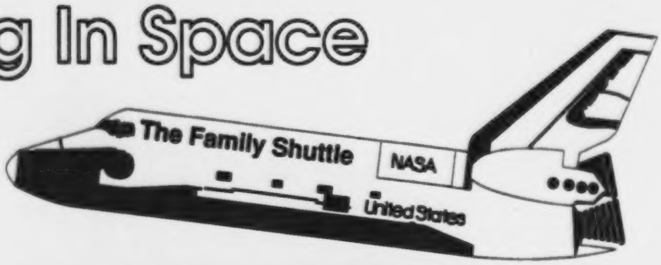
Because of limited space, astronauts do not have separate bedrooms. There are small, sleeping compartments on some orbiters. Astronauts also have places on the wall where sleeping bags can be attached. On some flights, everyone sleeps at the same time; on other flights, when there are tasks that must be done on a 24-hour basis, astronauts sleep in shifts. Since the shuttle goes around the Earth every 90 minutes, it goes through a whole "day and night" each time, causing a great deal of light to be in the cabin in the "daytime." The astronauts use a mask over their eyes to block out the light for sleeping.

Two astronauts sleep comfortably in their sleeping restraints. (NASA Photo)

Sleeping In Space

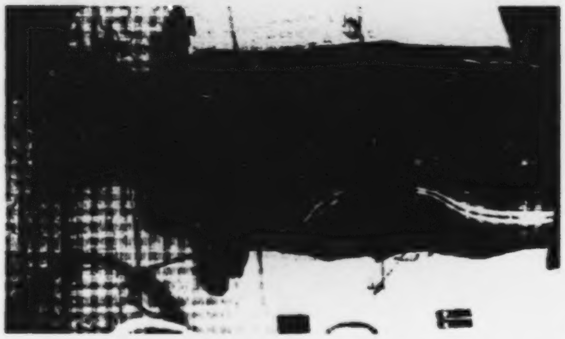
NOTES

Sleeping In Space



BACKGROUND NOTES

Because of limited space, astronauts do not have separate bedrooms. There are small, sleeping compartments on some orbiters. Astronauts also have places on the wall where sleeping bags can be attached. On some flights, everyone sleeps at the same time; on other flights, when there are tasks that must be done on a 24-hour basis, astronauts sleep in shifts. Since the shuttle goes around the Earth every 90 minutes, it goes through a whole "day and night" each time, causing a great deal of light to be in the cabin in the "daytime." The astronauts use a mask over their eyes to block out the light for sleeping.



Astronaut Judy Resnick sleeps, strapped to the side of the middeck. (NASA Photo)

MATERIALS NEEDED

Two-foot by eight-foot piece of material, safety pins, pillow, storybook about outer space or Moon or stars, handkerchief or scarf or piece of material for an eye mask.

ACTIVITY

In the classroom, children have been talking about how astronauts must sleep. The activities ask children to think about sleeping under unusual conditions. These family activities ask you to help simulate space shuttle sleep for your children.

1. Talk about what sleeping in outer space must be like. Talk about floating around all the time and the need to secure sleeping bags to the orbiter to make sure you do not float while you sleep. Discuss how it is daytime, then nighttime every 90 minutes and how hard it must be to sleep under those conditions. Talk about how tough it must be to sleep while other astronauts are working around you.

2. Ask your children if they want to make sleeping bags and pretend to sleep in outer space. Let your children help you make sleeping bags. Fold a two-foot wide by eight-foot long piece of material in half and safety pin the sides. Allow space for arms to hang out on the sides. Supply children with a head pillow.

3. At bedtime, tell your children that they may sleep with their space sleeping bags in their homemade spacecraft or they may pretend their bed is a space shuttle. Make sure they are comfortably tucked into their bags and read them a story about outer space or the Moon and the stars.

Sleeping In Space

4. If they are not asleep after you have finished reading the storybook, ask them to think about what they would see in outer space. Suggest they may see stars, the Moon, Earth, and maybe even city lights on Earth. In the morning, discuss how well your children slept and what they thought about as they fell asleep.

Two astronauts sleep comfortably in their sleeping restraints. (NASA Photo)

Want To Give Your Children More Space To Grow?

1. Make eye masks with your children and ask them if they want to pretend to take a nap in outer space while other family members go about their regular routine at home. Remind your children that astronauts sometimes have to sleep at odd hours and while other astronauts are working on board the space shuttle.

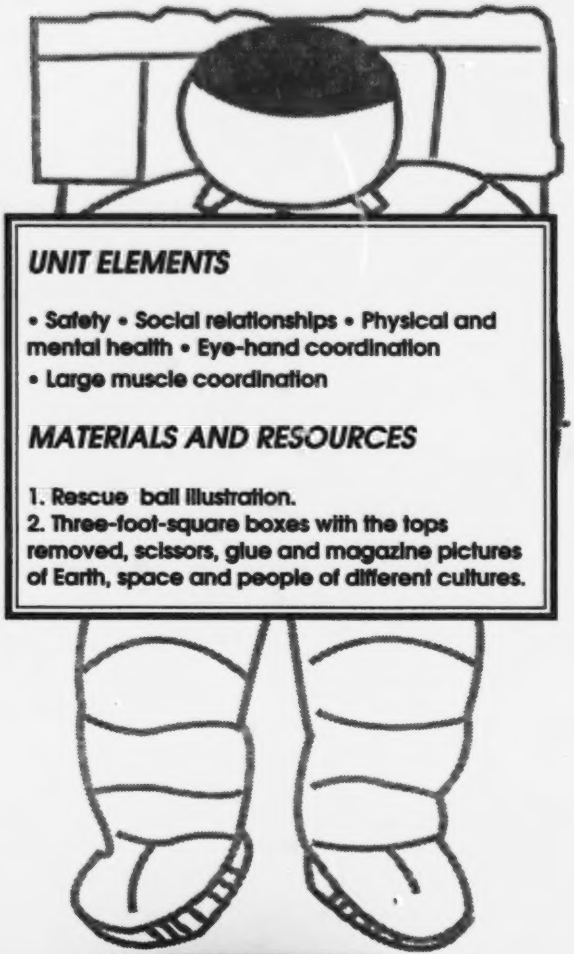
2. After your children have taken a nap, ask them how hard it was to fall asleep while other family members were moving around the house.

Safety In Space

DESCRIPTION

This activity focuses on a safety precaution which astronauts may take if something goes wrong during the orbital flight of the space shuttle. Orbiters are equipped with round, inflatable rescue balls where most of the space crew may go in case of an on-board emergency. Mario and Kim experienced such a situation in the story book, "The Youngest Astronauts," when the oxygen supply switch broke during the space flight. This activity provides you the opportunity to discuss safety and, if you choose, danger in space exploration. Tie this activity into a school fire drill practice, if possible.

Ensure that children do not become frightened by the rescue ball, just as they are not frightened by the place where they go during a fire drill. The ball is a place of temporary safety and refuge for astronauts. It also may be used as a private corner for children during free play and is suggested for use in "Wondering." Both activities provide very positive associations with the box. To avoid shape confusion for children during the activity, refer to the rescue enclosure the children make as a "rescue box."



UNIT ELEMENTS

• Safety • Social relationships • Physical and mental health • Eye-hand coordination
• Large muscle coordination

MATERIALS AND RESOURCES

1. Rescue ball illustration.
2. Three-foot-square boxes with the tops removed, scissors, glue and magazine pictures of Earth, space and people of different cultures.

Safety in space begins on the ground; demonstrated above by a crew practicing emergency firefighting procedures. (NASA Photo)

Safety In Space

ACTIVITY

1. Discuss safety in the classroom with children. Ask them what to do in case a fire alarm sounds while they are in the classroom. Practice a fire drill evacuation with children. While they are at their evacuation site, talk with them about this place where they go and wait until the chance of any danger has passed. Suggest they wait there because it is safe and nothing bad will happen to them.

2. Talk about sounds that warn children of danger. A truck backing up may make a sound telling them to get out of the way. A siren from a fire truck provides a similar warning. Children may know others.

3. Explain that if something happens while astronauts are in orbit during a space flight, there is a safe place where they can go. Show children the rescue ball photograph from the curriculum. Talk about the various drawings with children.

Explain to children that if anything should go wrong inside the space shuttle, most of the crew can stay in small, inflatable compartments until the trouble on the spacecraft is fixed or they are rescued. This is similar to a fire drill in the classroom. Everyone needs to know where to go and what to do in case something wrong occurs.

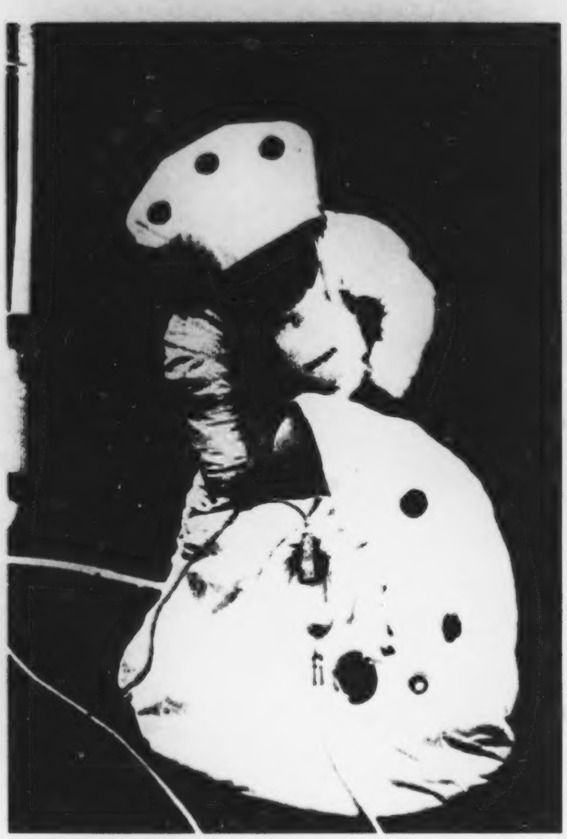
4. Make safety boxes to pretend with in dramatic play. Tell children that they may use the safety boxes as wonder windows and private corners at other times.

Make rescue boxes from three-foot-square boxes with the tops removed. Place the opened end of the box on its side so children may crawl into it. Supply children with scissors, glue and magazines with pictures of Earth, space and people of different cultures and let them decorate their escape boxes.

An astronaut slides down the side of an orbiter mockup, practicing an emergency exit, in case it may be required after landing. (NASA Photo)

5. Simulate an escape drill with the boxes. Perhaps they could take Portable Oxygen Supply system (POS) with them while other astronauts fix the problem in the spacecraft. Work out a warning signal with children and practice the evacuation procedure.

Safety In Space



An astronaut in a full space suit practices zipping a crew member in a rescue ball. (NASA Photo)

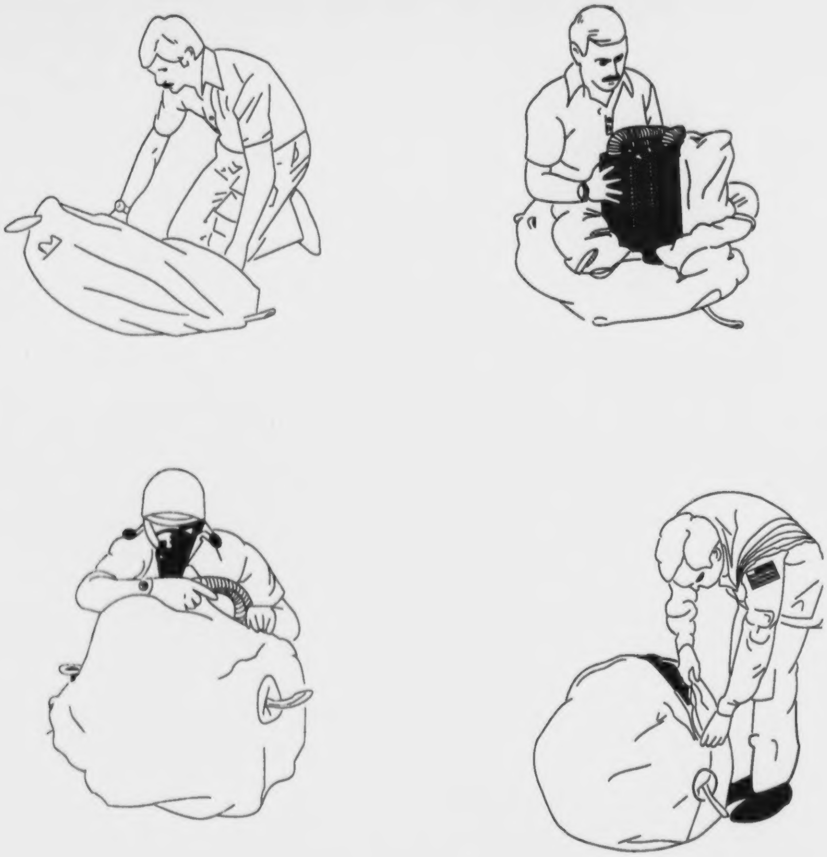
6. Explain to children that during space travel, astronauts are very busy and need to be alert and ready to react quickly to any situation. Ask them if they want to participate in a "quickness" training activity. The object is to pass a "signal" (a squeezed hand) to the next child as quickly as possible. Demonstrate activity with small group of children in a circle. Hold hands. Lightly squeeze child's left hand. Using the right hand, that child should squeeze the left hand of the next child and so on, until the "squeeze" comes back to you. Let children practice a few times. Use small groups so children do not have to wait long for a squeeze. Vary the activity by reversing the direction of the squeeze or squeezing with eyes closed.

7. Let children practice jumping on numbered squares as another quickness activity. Demonstrate and let them play independently as long as they wish. If possible, leave the numbers on the squares for the duration of this module.

BACKGROUND NOTES

To save valuable storage space on shuttle flights, there are only two space suits on board. If something dangerous occurs, the two astronauts in their space suits help other astronauts into portable inflatable rescue balls. Oxygen is supplied by a Portable Oxygen Supply system (POS) which the astronauts carry with them. Each crew member stays in a rescue ball until the problem is corrected.

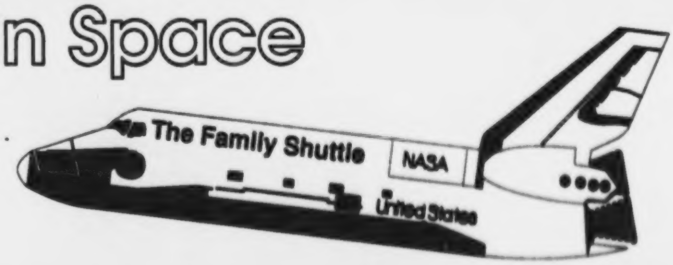
The two astronauts wear their spacesuits, which supply them with oxygen while they fix the spacecraft's problem. After the danger has passed, other crew members are helped from their rescue balls by the two space suited astronauts.



The above sequence of drawings shows the process of using the Rescue Ball. In the upper left corner, the astronaut unzips the ball, in the upper right the astronaut dons the Portable Oxygen System (POS), in the lower left the astronaut sits in the ball and in the lower right the astronaut is zipped "in" the Rescue Ball, prepared for transportation.
(YAC Illustration)

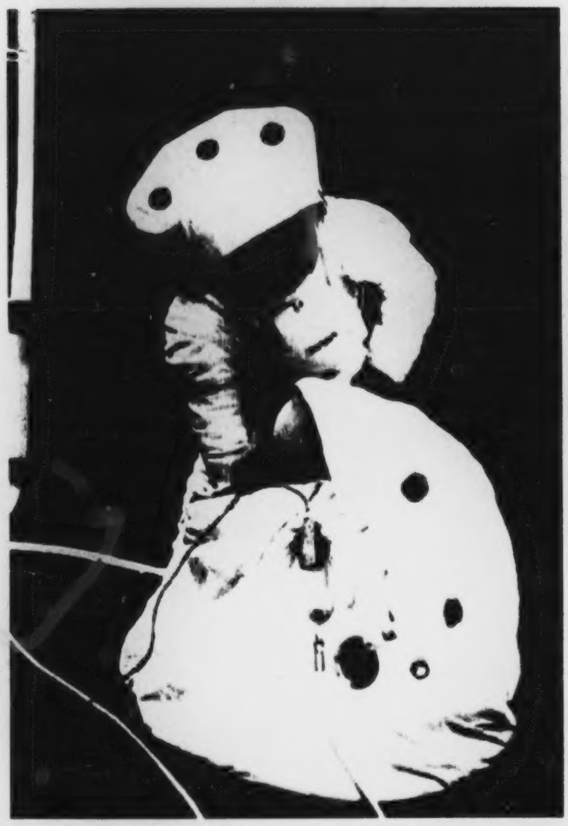
NOTES

Safety In Space



BACKGROUND NOTES

To save valuable storage space on shuttle flights, there are only two space suits on board. If something dangerous occurs inside the spacecraft during orbital flight, the two astronauts in space suits help other astronauts into portable, inflatable rescue balls. Oxygen is supplied by Portable Oxygen Supply systems (POS) which the astronauts carry with them.



An astronaut in a full space suit practices zipping a crew member in a rescue ball. (NASA Photo)

Crew members stay in the balls until the problem is corrected. The two astronauts wear their space suits with a supply of oxygen while they fix the spacecraft's problem. After the danger has passed, other crew members are helped from the rescue balls by the two astronauts.

ACTIVITY

Children have been learning that astronauts must be alert and quick during space travel . They must be prepared for an emergency in case something unexpected happens during orbital flight. The following family activities give you an opportunity to extend these ideas at home.

1. Discuss the need for your children to be quick and alert. Suggest that when they hear a fire alarm in school, they have to move quickly to a safe place.

Ask your children if they want to make a safety box like astronauts could use if something happens on the orbiter while it is circling Earth. Tell them that they may use their safety boxes as wonder windows or private corners at other times. Make safety boxes from three-foot square boxes with the tops removed. Place the open end of the box on its side so children may crawl into it. Supply them with scissors, glue and magazines with pictures of Earth, space and people of different cultures. Let your children decorate their safety boxes.

2. Practice a safety drill similar to a fire drill in the home. Have your children go as quickly as possible to their safety boxes when they hear a signal which your family has agreed upon. Use another signal to let them know it is all right to crawl out of their safety boxes.

Safety In Space

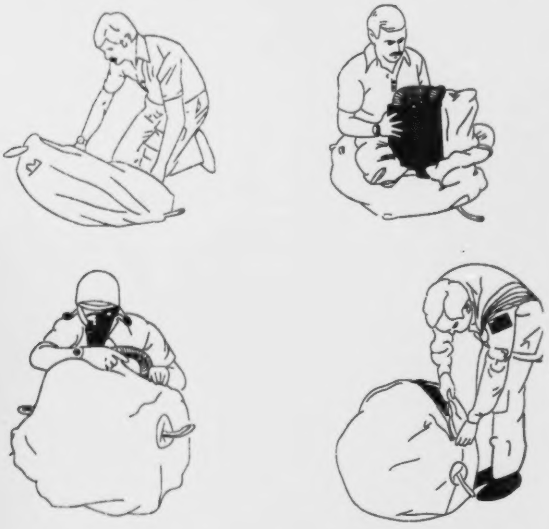
An astronaut slides down the side of an orbiter mockup, practicing an emergency exit, in case it may be required after landing. (NASA Photo)

3. Discuss the experience with your children and periodically have safety box drills to practice quickness.

4. Let your children use the safety box as a private corner where they may go from time-to-time to be by themselves.

MATERIALS NEEDED

Three-foot-square boxes, scissors, glue and magazine pictures of Earth, space and people of different cultures.



The above sequence of drawings shows the process of using the Rescue Ball. In the upper left corner, the astronaut unzips the ball, in the upper right the astronaut dons the Portable Oxygen System (POS), in the lower left the astronaut sits in the ball and in the lower right the astronaut is zipped "in" the Rescue Ball, prepared for transportation.
(YAC Illustration)

Want To Give Your Children More Space To Grow?

Let your children practice quickness with a game outdoors.

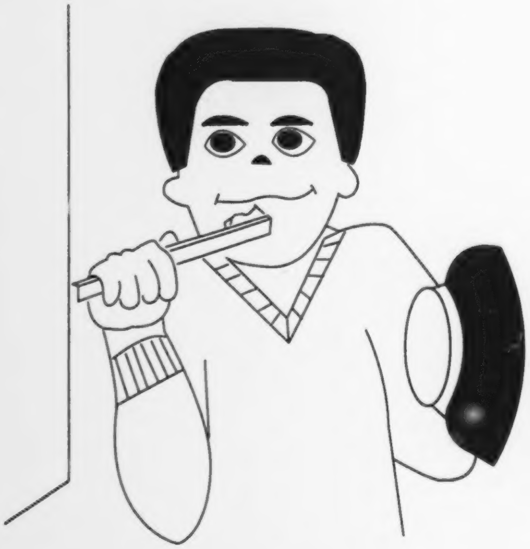
Personal Hygiene In Space

DESCRIPTION

Shuttle flights introduce some unique ways to handle personal hygiene. Children are asked to think about and simulate some of these as they progress through the activity. Weightlessness and the lack of gravity do not curtail any body function in space. Astronauts function as they do on Earth. A lack of gravity, however, does present problems for using toileting facilities. Help children relate these space shuttle practices to their everyday need to maintain safe and healthy, personal grooming.

ACTIVITY

1. At the beginning of a school day, ask children to brush their teeth the same way astronauts brush during space flights. Demonstrate model brushing with a toothbrush, toothpaste and a paper towel or washcloth in the classroom. Use the paper towel or washcloth (instead of the sink) to deposit the toothpaste in your mouth when you are finished. Discuss children's reactions to your technique.



Mario, from the "Youngest Astronauts"storybook, brushes his teeth in space. (YAC Illustration)

UNIT ELEMENTS

• Health • Safety •Imagining • Symbol recognition • Dramatic play

MATERIALS AND RESOURCES

1. Toothbrushes, toothpaste and paper towel or washcloth.
2. Piece of clear plastic, tape, sink or plastic dishpan.
3. Box with dividers, color-coded washcloths or towels and matching swatch of fabric for each child.
4. Hotel-sized bars of soap.

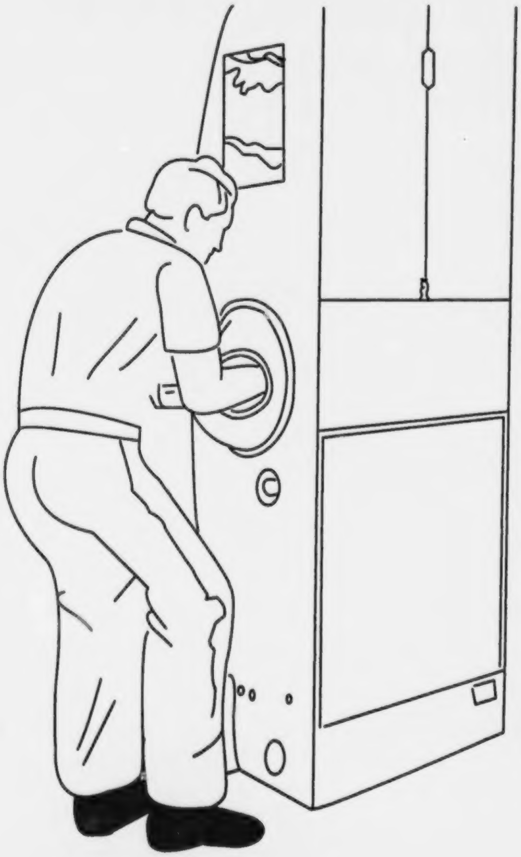
Explain to children that in outer space everything floats around if it gets loose, even people. That is why you had to spit toothpaste into your own washcloth. Tell them that you could not spit into a sink because currently sinks in spacecraft are different from those we use on Earth. Tell the children that you are going to make them a space shuttle sink to use, but first ask them to brush their teeth, astronaut style.

Supply each child with a toothbrush, paste and a moist washcloth or paper towel. Let them simulate brushing in space. Discuss their reactions.

Personal Hygiene In Space

2. Tell children that in space travel, sinks must be covered. Ask if they can think of any reason for this. Tell them that water would float out from an open sink and create problems. Water could get into electrical equipment and cause serious damage, for example. Dirty water could float around and spread germs and disease. Ask children if they have any ideas about making a sink with a cover on it.

Make a space shuttle sink for children. Place a piece of plastic over the sink which children normally use and tape the edges. Cut one hole in the center of the plastic for children to insert and wash their hands. Cut a smaller hole directly below the faucet for changing water frequently. Let children wash their hands throughout the day with the space sink.



Specially designed sinks are used during space shuttle flights. (YAC Illustration)

Another way to make a space sink in the classroom is to use a plastic dishpan. Follow the same method used for a running water sink. Be sure to change the water often.

3. Explain to children that each astronaut on board the shuttle has separate washcloths and towels. These are color-coded so one astronaut does not use another's washcloths or towel. Each astronaut has a color-coordinated cubicle on board where washcloth and towels are kept separated. Ask children why this hygiene procedure is followed during space travel. Ask the children if they want to practice with washcloths and towels.

Find a box such as one for glass bottles, with dividers still inside. Use these little cubicles in the box to place color-coded washcloths or towels for each child. Find different colored material from which you can make children's washcloths. Keep a swatch of material to staple to the cubicles of the box so children may identify where their washcloths belong. Tell children how sometimes sharing is not such a good idea. Sharing toothbrushes, washcloths and towels is unhealthy. Ask them for other examples which they may know.

4. Tell children how astronauts shower or take a bath during shuttle flights. Tell them astronauts take "sponge baths." Explain what a sponge bath is. Ask them if they know of any examples. Some of the children may have taken one while camping or when they were sick.

Help the children practice taking a sponge bath with their exposed body parts. Supply them with hotel-sized bars of soap, washcloths, towels and possibly a space shuttle sink. Discuss the process with children as they bathe.

Personal Hygiene In Space

5. If children ask about toileting, explain to them that astronauts secure themselves to a toilet so they do not float around. Suction in the toilets draws body waste into holding containers. Later, scientists on Earth study the waste to see what vitamins, minerals and other substances have been lost by the astronauts while in outer space.

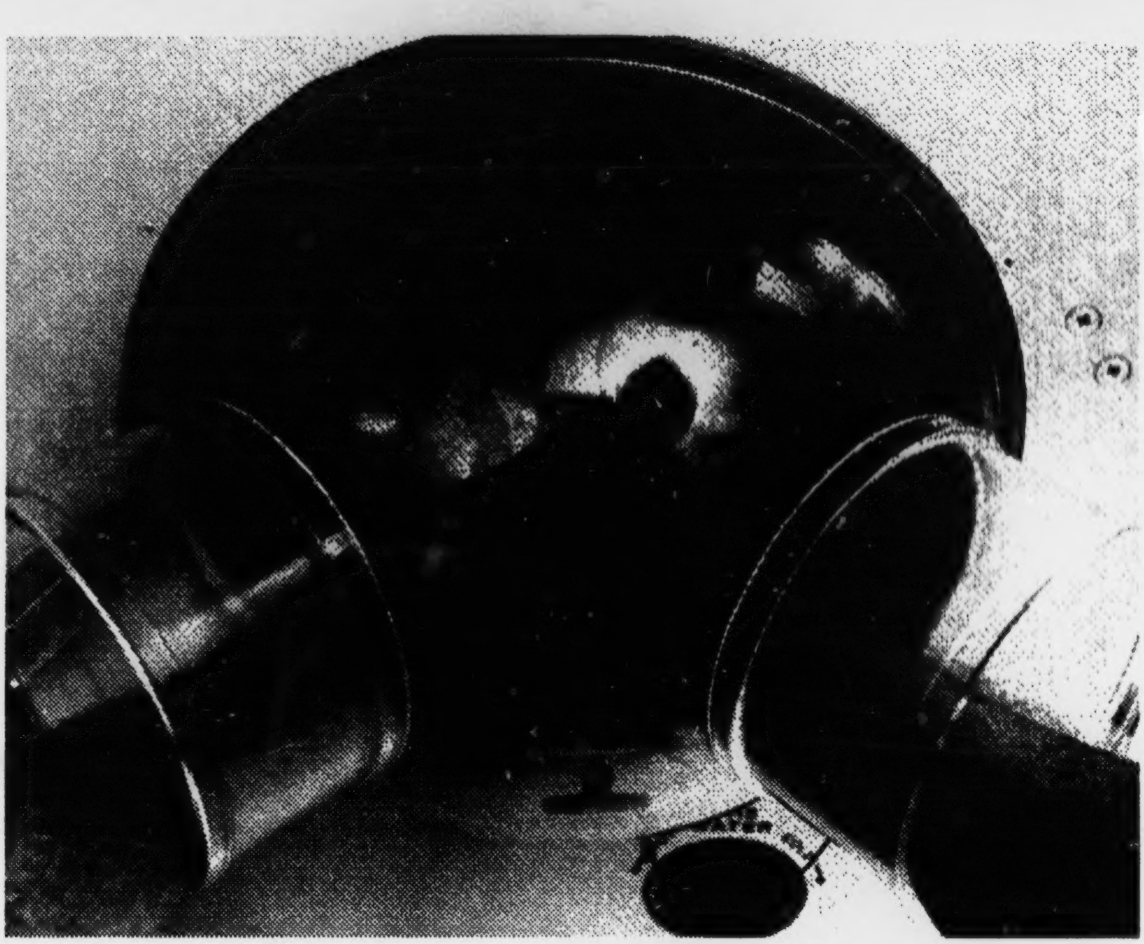
6. Ask a dental hygienist and a nurse to talk with the children about dental and personal hygiene during these activities.

An astronaut shaves in space, using ordinary shaving cream and razor. (NASA Photo)

BACKGROUND NOTES

Weightlessness creates unique problems for space travelers when using the toilet or taking a shower. Body wastes, like everything else in the spacecraft, would float around and be very unpleasant—if not contained. The toilet in the shuttle therefore uses air to suck body wastes into holding bags. Showers would drench the cabin in the shuttle, so, at present, astronauts wash themselves with washcloths. Longer space flights, such as those in the Skylab in the 1970's, had a special enclosure and special equipment that allowed showers. The "Space Shuttle-Operator's Manual" has good, fact-filled descriptions with illustrations of hygiene facilities.

Personal Hygiene In Space



Specially designed sink prevents water from floating around the spacecraft.
(NASA Photo)

NOTES

Personal Hygiene In Space

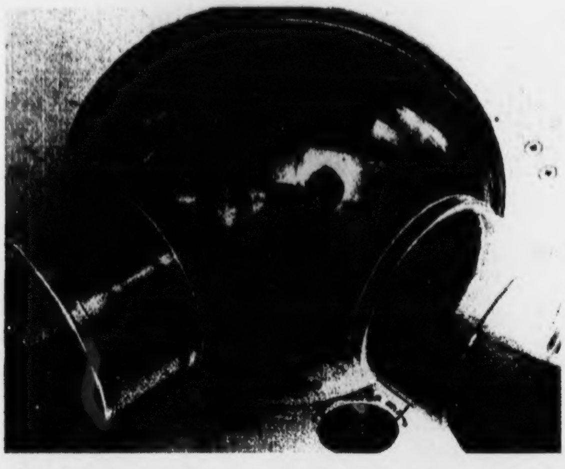
The Family Shuttle
NASA
United States

BACKGROUND NOTES

Weightlessness creates unique problems for space travelers when using the toilet or taking a shower. Body wastes, like everything else in the spacecraft, would float around and be very unpleasant—if not contained. The toilet in the shuttle therefore uses air to suck body wastes into holding bags. Showers would drench the cabin in the shuttle, so, at present, astronauts wash themselves with washcloths. Longer space flights, such as those in the Skylab in the 1970's, had a special enclosure and special equipment that allowed showers. The "Space Shuttle-Operator's Manual" has good, fact-filled descriptions with illustrations of hygiene facilities.

MATERIALS NEEDED

Piece of plastic or plastic wrap, tape, scissors, sink or dishpan.



Specially designed sinks are used during space shuttle flights.
(NASA Photo)

ACTIVITY

Outer space travel introduces some unique ways to handle personal hygiene. In the classroom, children are asked to think about and simulate some of these personal health and safety issues as they work through activities. All body functions must be performed while in outer space, but the way they are carried out is different in many instances. Work with your children at home to extend some of the things that they are learning at school.

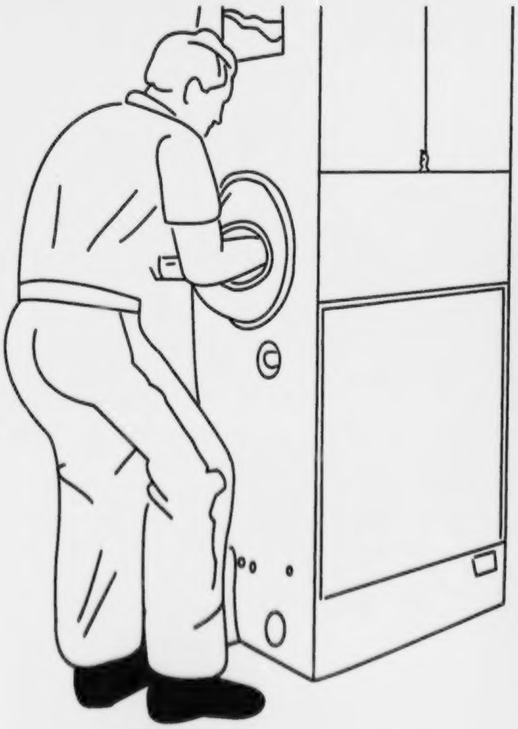
1. Explain to your children that during space shuttle flights, sinks must be covered. Ask them if they can think of any reason why this is so.

Tell them that water would float in an open sink and cause problems. Water could get into electrical equipment and cause serious damage, for example. Dirty water could float around and spread germs and disease. Ask your children if they have any ideas about making a sink with a cover on it.

2. Make a space shuttle sink for your children. Place a piece of plastic over the bathroom sink which children normally use and tape the edges. Cut one hole in the center of the plastic for children to insert and wash their hands. Cut a smaller hole directly below the faucet for changing water frequently. The illustration on this page provides a model for you to follow. Let family members wash their hands throughout the day with the space sink and ask them to talk about their reactions.

3. Another way to make a space sink at home is to use a dishpan. Follow the same directions used for the running water sink. Be sure to change the water frequently.

Personal Hygiene In Space



Specially designed sink prevents water from floating around the spacecraft. (YAC Illustration)

An astronaut shaves in space, using ordinary shaving cream and razor. (NASA Photo)

Want To Give Your Children More Space To Grow?

1. Talk about how astronauts shower or take a bath during shuttle flights. Tell them that astronauts take "sponge baths." Explain what a sponge bath is. People take sponge baths while they are camping, sick or when water is scarce. Help your children practice taking a sponge bath and talk about it.

2. Ask your family to discuss when sharing is not such a good idea. Sharing toothbrushes and washclothes can be unhealthy. Ask them for other examples where sharing is not healthy.

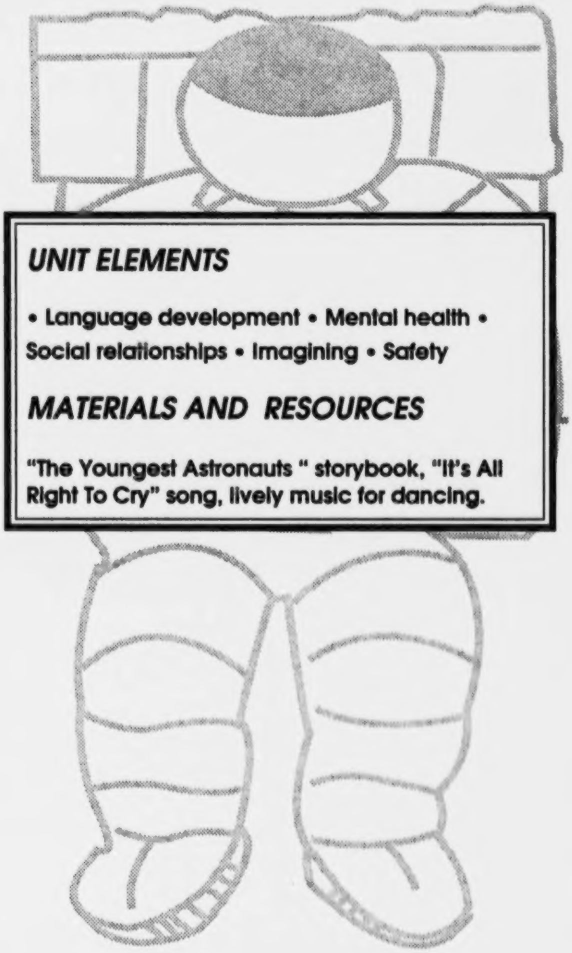
3. If your children ask about toileting on the space shuttle, explain that astronauts secure themselves to a toilet so they do not float around. Suction in the toilets draws waste into holding containers. Later, scientists on Earth study the waste to see what vitamins, minerals and other substances have been lost by the astronauts while in outer space.

Handling Stress

DESCRIPTION

This activity draws attention to stress which is present during space shuttle flights. Many preschoolers have experienced stress. The setting was probably not as dramatic as a space flight, but the stress is just as powerful and real to the children who experienced it.

Remember this as you progress through the activity. Avoid traumatic, personal experiences of children. If such a situation should arise, calm the child as best you can and seek the help of a mental health professional.



UNIT ELEMENTS

• Language development • Mental health • Social relationships • Imagining • Safety

MATERIALS AND RESOURCES

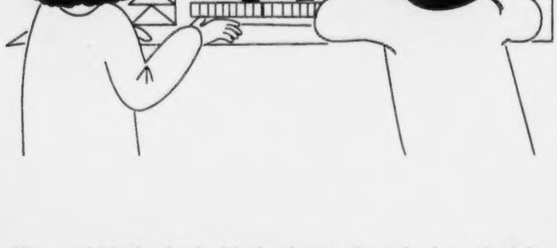
"The Youngest Astronauts " storybook, "It's All Right To Cry" song, lively music for dancing.

ACTIVITY

1. Read "Living In Space" and "Problems In Space" sections of "The Youngest Astronauts" storybook. Ask the children why Kim and Mario are disappointed in the story. Ask them if they would be sad about not going to outer space. Discuss what makes them sad. Keep a list of their answers.

Ask them how they deal with disappointment. Keep notes on this also. Share a few ways to overcome sadness. Tell them that if you are sad, you talk about why you are sad with the person who made you feel that way. Or you talk about your sadness with a friend if something upsets you.

Use examples of disappointment which children have supplied and demonstrate these techniques with two astronaut puppets. Apple-head puppets could be constructed from materials used in LIS # 13, "DRYING FOODS," for this.



Kim and Mario deal with the frustration of a launch delay. (YAC Illustration)

Handling Stress

Let children practice this technique with the puppets.

Tell children another way to get over feeling sad is to cry. Play the song, "It's All Right To Cry." Talk about the meaning of the song with the children.

Let children know that dancing may lessen unhappy feelings. Play a lively record or cassette and let the children dance.

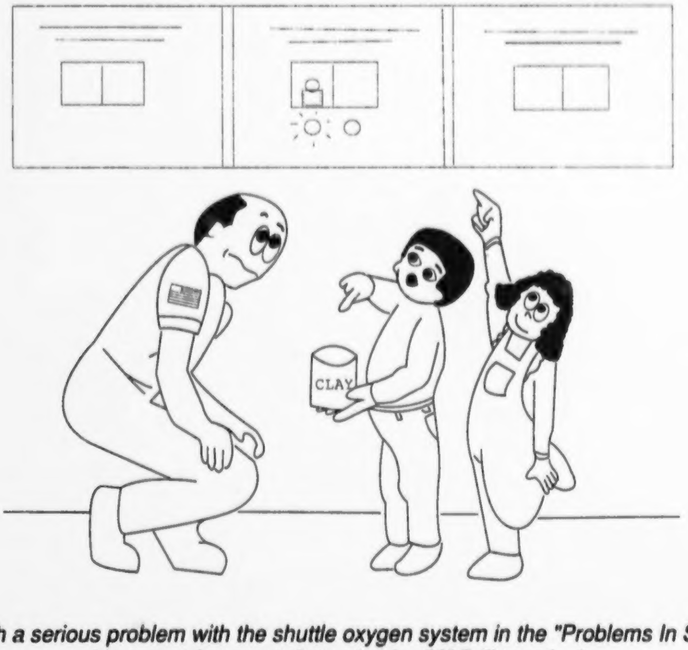
2. Reread "The Youngest Astronauts" chapter which describes how Mario and Kim helped solve the space shuttle problem by staying calm. Discuss the need to stay calm while living in space. Tell the children that staying calm means not getting excited. Ask them to list what makes them excited. Suggest that sometimes it is fun to get excited. Other times excitement makes us feel not so good. Help them think of "good excited" and "bad excited" examples, such as attending picnics and being lost in the grocery store, respectively.

Tell the children you know of one way to help them stay calm. Show them relaxation breathing techniques. Have children sit with legs crossed, hands in laps, eyes closed as you say, "Breathe in...Breathe out," slowly and gently, eight to ten times. Children may enjoy lying down for this activity.

Tell them that all the astronauts from all over the world say that the calmest, most beautiful thing they ever have seen from their spacecraft is Earth. Ask children to think of the most beautiful thing they can imagine or have seen. If they need help, suggest they think about traveling through clouds as they float through the heavens.

When the children have finished, ask them if they want to share their calm thoughts with the group, and write them down.

3. Use the lists you have compiled to talk with children about sources of stress and anxiety and ways to cope with these feelings.



Kim and Mario deal with a serious problem with the shuttle oxygen system in the "Problems In Space" section of "The Youngest Astronauts" storybook. (YAC Illustration)

Handling Stress

BACKGROUND NOTES

Spacecraft have almost always been small and cramped, conditions which are conducive to stress. Like submariners, space crews have to learn to work together in small, dangerous places. The Gemini spacecraft in the 1960's carried two astronauts who sat in one position for up to two weeks. Imagine sitting in a tiny car for two weeks without getting out!

Astronauts have tremendous physical and emotional stress from the beginning of the flight through completion of their assignment. The pounding of their hearts on the launching pad, three G's of force exerted on their bodies during lift-off, the awareness during orbit and landing that something may go wrong with the most complex astronautical program ever implemented are stress aspects astronauts must deal with effectively.

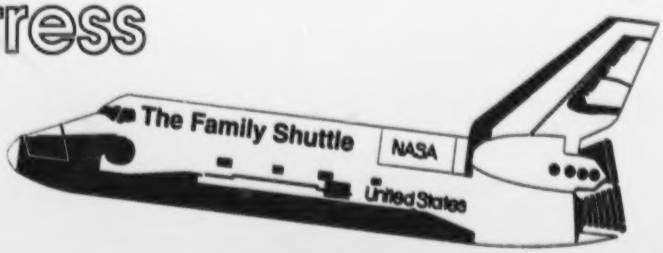
Crews aboard the space shuttle learn to adjust to stressful conditions. (NASA photo)

Handling Stress

Astronauts are struck by the serene beauty of Earth as they watch it from their spacecraft. (NASA Photo)

NOTES

Handling Stress



BACKGROUND NOTES

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An astronaut floats around the shuttle, relaxing in the cramped environment. (NASA Photo)

ACTIVITY

Children in the classroom are discussing stress that is caused by space shuttle flights. Many preschoolers have experienced stress themselves. The setting was probably not as dramatic as a space flight, but the stress is just as powerful and real to the children who experienced it.

All of us experience frustration and stress to some degree. Throughout these activities, tell your children that most times talking with people who are important to us helps relieve the tension which builds up inside us.

1. Tell your children that in outer space, it is very important that astronauts do not get angry or frustrated. Explain that if those things were to happen, astronauts could not relax and do their jobs correctly. That could mean trouble for the flight.

Talk about things which make your children sad, angry, frustrated or cause stress. Make sure everyone has a chance to speak. Ask for suggestions to reduce or eliminate the problems. Keep a list of both the problems and the possible solutions. Let the family decide which solutions are probably best and why they think that way.

MATERIALS NEEDED

Paper and pencil for making a list.

Handling Stress

Astronauts are struck by the serene beauty of Earth as they watch it from their spacecraft. (NASA Photo)

Want To Give Your Children More Space To Grow?

1. Tell your children that staying calm in outer space is important and discuss why this is true. Explain to them that staying calm means not getting excited. Ask them to list things that make them excited. Suggest that sometimes it is fun to get excited. Other times excitement makes us feel not so good. Help them think of "positive excitement" and "negative excitement" examples, such as going on a picnic and being lost in the grocery store, respectively.

2. Tell your children that you know of one way to help them stay calm. Show them relaxation breathing techniques. Have them sit with legs crossed, hands in laps, eyes closed as you say, "Breathe in...Breathe out," slowly and gently eight to ten times. Your children may enjoy lying down for this activity.

Tell them that all the astronauts from all over the world say that the calmest, most beautiful thing they ever have seen from their spacecraft is Earth. Ask the children to think of the most beautiful thing they can imagine. If they need help, suggest they think about traveling through clouds and touching stars as they float through the galaxy.

Exercise In Space

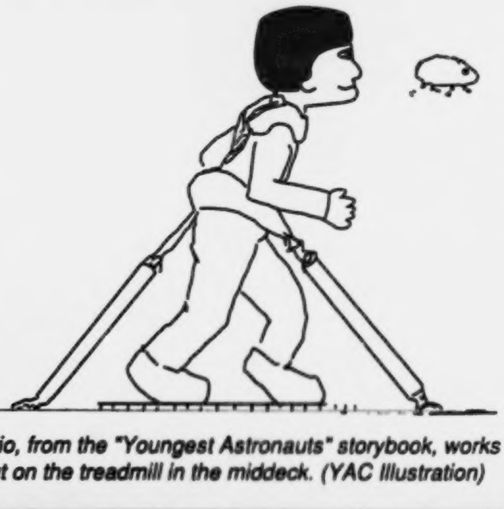
DESCRIPTION

Prolonged space travel has some negative impact on the physical condition of astronauts. Muscles and bones start to deteriorate in outer space. Cramped living areas may lead to psychological stress. Both these situations require astronauts to exercise vigorously in a small area during long space flights to help offset the negative impact of outer space travel. Children are asked to perform some exercises in this activity which require relatively little space.

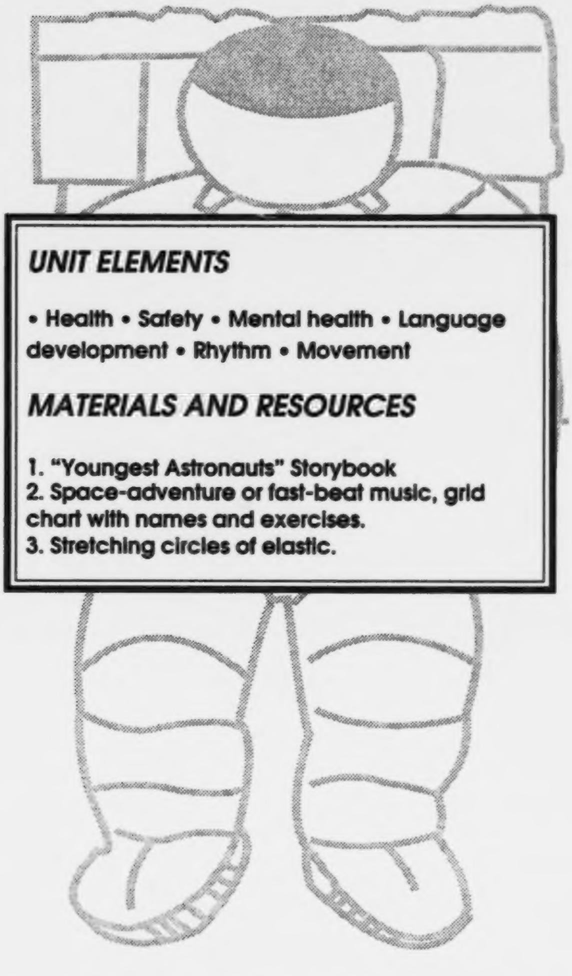
Many of the exercises are from materials produced by the President's Council on Physical Fitness and Sports.

ACTIVITY

1. Show children pictures of astronauts in the space shuttle. Ask them how they think astronauts jog or play ball while they are in the shuttle. Suggest there is very little room for exercise, but it is extremely important in space travel. Tell them that just to maintain physical health on long trips, astronauts will have to exercise two to four hours a day. Show them the illustration of Mario exercising on the treadmill in "The Youngest Astronaut" storybook and discuss exercising-in-place without moving.



Mario, from the "Youngest Astronauts" storybook, works out on the treadmill in the middeck. (YAC Illustration)



UNIT ELEMENTS

• Health • Safety • Mental health • Language development • Rhythm • Movement

MATERIALS AND RESOURCES

1. "Youngest Astronauts" Storybook
2. Space-adventure or fast-beat music, grid chart with names and exercises.
3. Stretching circles of elastic.

2. Try some exercises that could be done in the shuttle. Choose exercises from the list below. Add some of your own favorites and ask children for other suggestions. Provide some space-adventure or fast-beat music as children exercise.

When physically possible, let children feel the muscles that they are working. This concrete connection between exercise and muscle movement is important. Caution children against "bouncing" or "jerking" their bodies during

exercise. Strained and torn muscles could result from that. Also let children stop exercising if they tire.

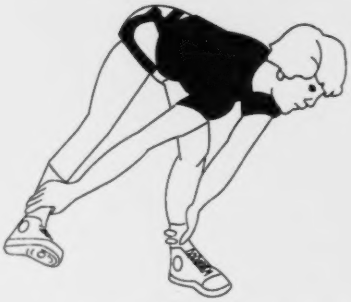
Make a grid chart with children's names, names of exercises and blank spaces for marking how many and/or how much of each exercise has been performed by each child at different times. Let children exercise on an on-going basis and chart their results.

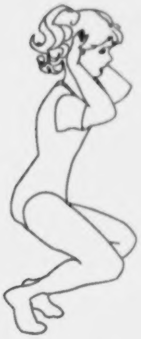
Exercises which may be performed in a small area include:

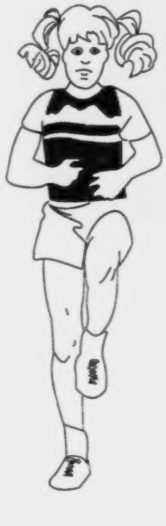
Jog in Place
Bunny Hop
Gorilla Walk
Jump Up and Down on Two Feet

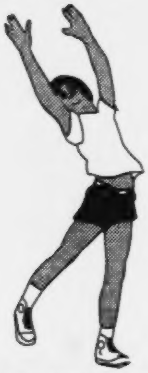
3. Invite an elementary school teacher to exercise with the children. Parents may enjoy the presentation also.

4. Make stretching circles of elastic (for exercising) from one-inch-wide elastic bands cut in six-inch lengths and sewn in a circle. Children may exercise by stretching the elastic with both hands, with both feet, with one foot and with one hand. Ensure that the elastic does not slip from a hand or foot and hit any child in the face during the activity.


Gorilla Walk. (YAC Illustration)


Bunny Hop. (YAC Illustration)


Running In Place. (YAC Illustration)


Trees In The Wind (YAC Illustration)

Exercise In Space

BACKGROUND NOTES:

It is hard to keep fit while living in space. Not much natural exercise is possible. Furthermore, weightlessness creates problems; muscles go slack and bones get brittle when they do not have to work as hard as they do on Earth where they work constantly against the pull of gravity. An astronaut, who is not being pulled constantly by gravity, can actually "grow" two inches in height. Red blood cell counts go down, and the weightless astronaut can lose over 20% of his or her heart muscle. Astronauts on short trips have to exercise at least an hour a day. On long trips in the future, they will have to exercise two to four hours a day. A commonly used device on spacecraft is a treadmill to which the astronaut is anchored by elastic straps.

An astronaut works out on the treadmill in the middeck. (NASA Photo)

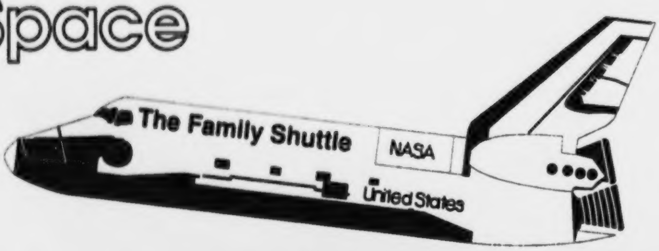
Exercise In Space

CABIN
TEMP
CONTROL

Biomedical testing and research is conducted to help determine the exercise needs for space travelers. (NASA Photo)

NOTES

Exercise In Space



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It is difficult to keep fit while living in space. Not much natural exercise is possible. Furthermore, weightlessness creates problems; muscles go slack and bones get brittle when they do not have to work as hard as they do on Earth, where they work constantly against the pull of gravity. An astronaut who is not being pulled constantly by gravity can actually "grow" two inches in height. Red blood cell counts go down and the weightless astronaut can lose over 20 percent of his or her heart muscle. Astronauts on short trips have to exercise at least an hour a day. On long trips in the future, they will have to exercise two to four hours a day. A commonly used device on spacecraft is a treadmill to which the astronaut is anchored by elastic straps.

ACTIVITY

Explain to your children that prolonged space travel has some negative impact on the physical condition of astronauts. Muscles and bones start to deteriorate in outer space. Cramped living areas may lead to psychological stress. Both situations require astronauts to exercise vigorously during long space flights to help offset the negative impact of outer space travel.

Ask your children to perform some exercises which require relatively little space.

Choose exercises from the list (provided). Add some of your own favorites, and ask your children for other suggestions. Provide some space-adventure or fast beat music as they exercise.

Let children feel the muscles that they are working. This concrete connection between exercise and muscle movement is important.

An astronaut works out on the treadmill in the middeck. (NASA Photo)

Caution children against "bouncing" or "jerking" their bodies during exercise. Strained and torn muscles could result from that. Also, let children feel free to stop exercising if they tire. Let children exercise on an on-going basis and chart their results.

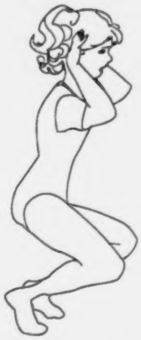
Exercise In Space

Exercises which may be performed in a small area include:

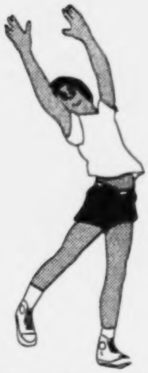
- Jog in Place
- Tortoise and Hare
- Bunny Hop
- Gorilla Walk
- Jump Up and Down on Two Feet

MATERIALS NEEDED

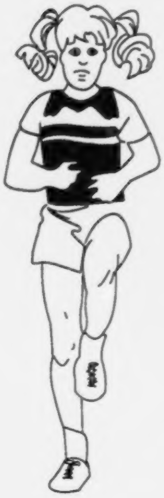
None.



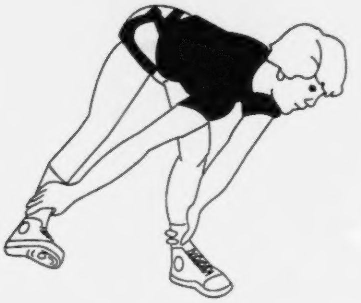
Bunny Hop. (YAC Illustration)



Trees In The Wind (YAC Illustration)



Running In Place. (YAC Illustration)



Gorilla Walk. (YAC Illustration)

Want To Give Your Children More Space To Grow?

Jog or walk fast around the block with your family. Talk about how this exercise makes all of you feel.

Creative Movement

UNIT ELEMENTS

• Rhythm • Movement • Imagining • Creativity
• Language development

MATERIALS AND RESOURCES

Space-associated music with no lyrics.

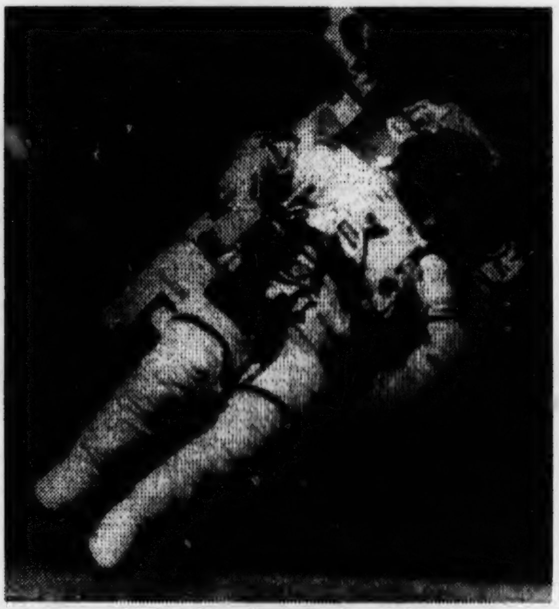
DESCRIPTION

Children have experienced a number of air and space adventure activities which lend themselves to creative movement. In addition, creative movement is a natural extension of the stress and exercise units. Possibilities also exist for relating creative movement to the various cultural aspects of life which the children have discussed in different units.

Because creative movement is a fundamental activity for preschoolers, encourage freedom of expression and integrate it into many module units.

ACTIVITY

1. Play some space-associated music with no lyrics for the children periodically. Music associated with space adventure is usually light and ethereal or heavy and ominous. The exaggeration of the music will suggest movement to children.



Astronaut McCandless floats freely outside the shuttle, untethered. (NASA Photo)

2. Simulate a space shuttle countdown with the children in a crouched position. Let children gradually stand up as they countdown and jump as they lift-off. Encourage children to stretch, twist and rotate as they approach orbit.

3. Explain that an orbit is a "squeezed-in-the-middle circle" and let children float around in orbit as you play light and airy music. Encourage children to hum, buzz or purr the way they think a shuttle may sound in flight.

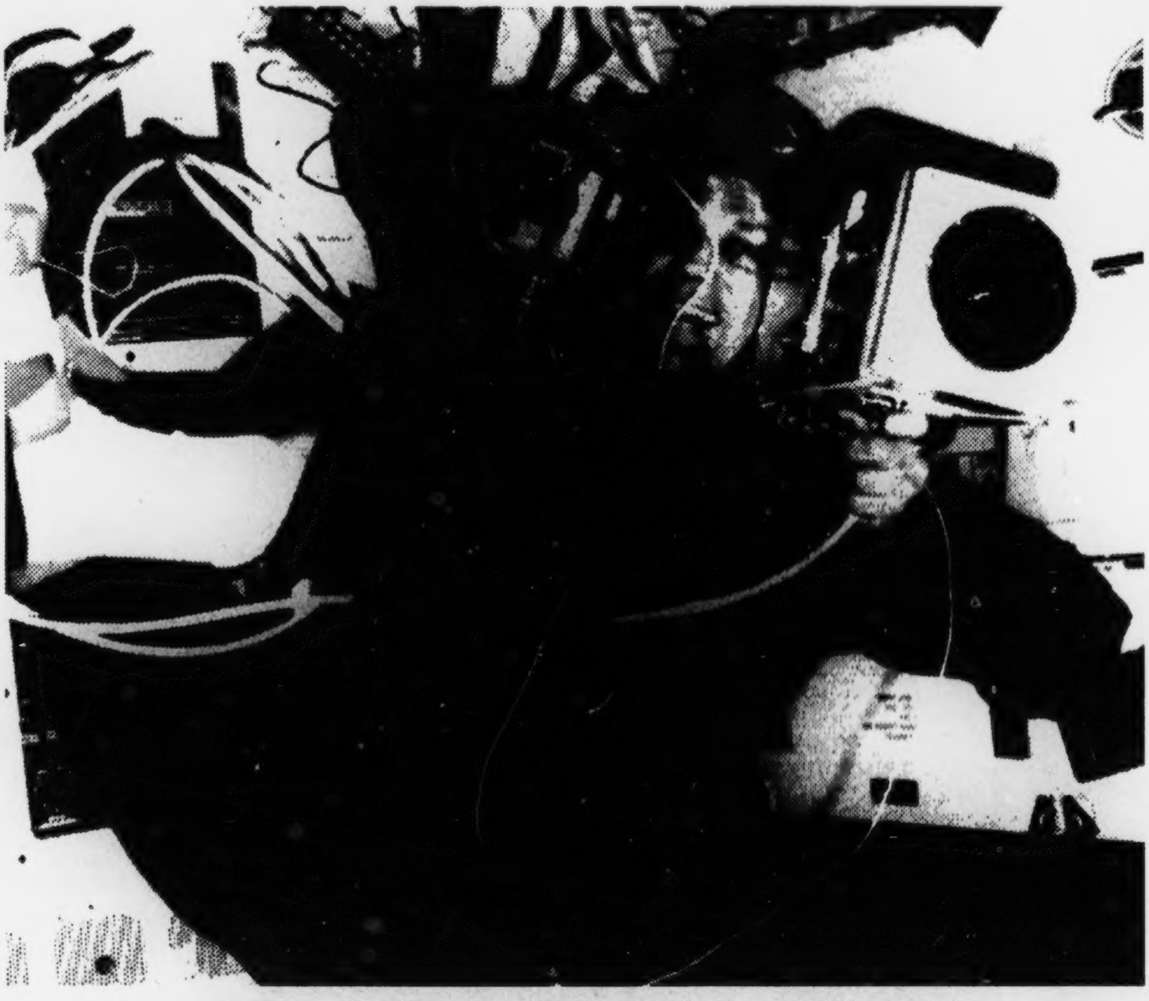
Creative Movement

4. Ask children to discuss dried apples and help them recall the shrinking that took place. Ask children to pretend they are apples drying in the sun. Demonstrate a shrinking, shriveling, pulling-your-body-into-itself movement to help children with the idea.

5. Ask children to walk on the Moon or Mars. They will have to use exaggerated steps and slow movements because they weigh much less and can not move as fast as they can on Earth.

6. Let them pretend to be clouds moving in the sky. Try being clouds during a tornado, a thunderstorm and on a calm, peaceful day. Music or tape-recorded sound effects may help.

7. Suggest children pretend to float inside a spacecraft. If they were in the weightless environment of outer space, they would gently bump into things and gently push themselves in the direction they want to go.



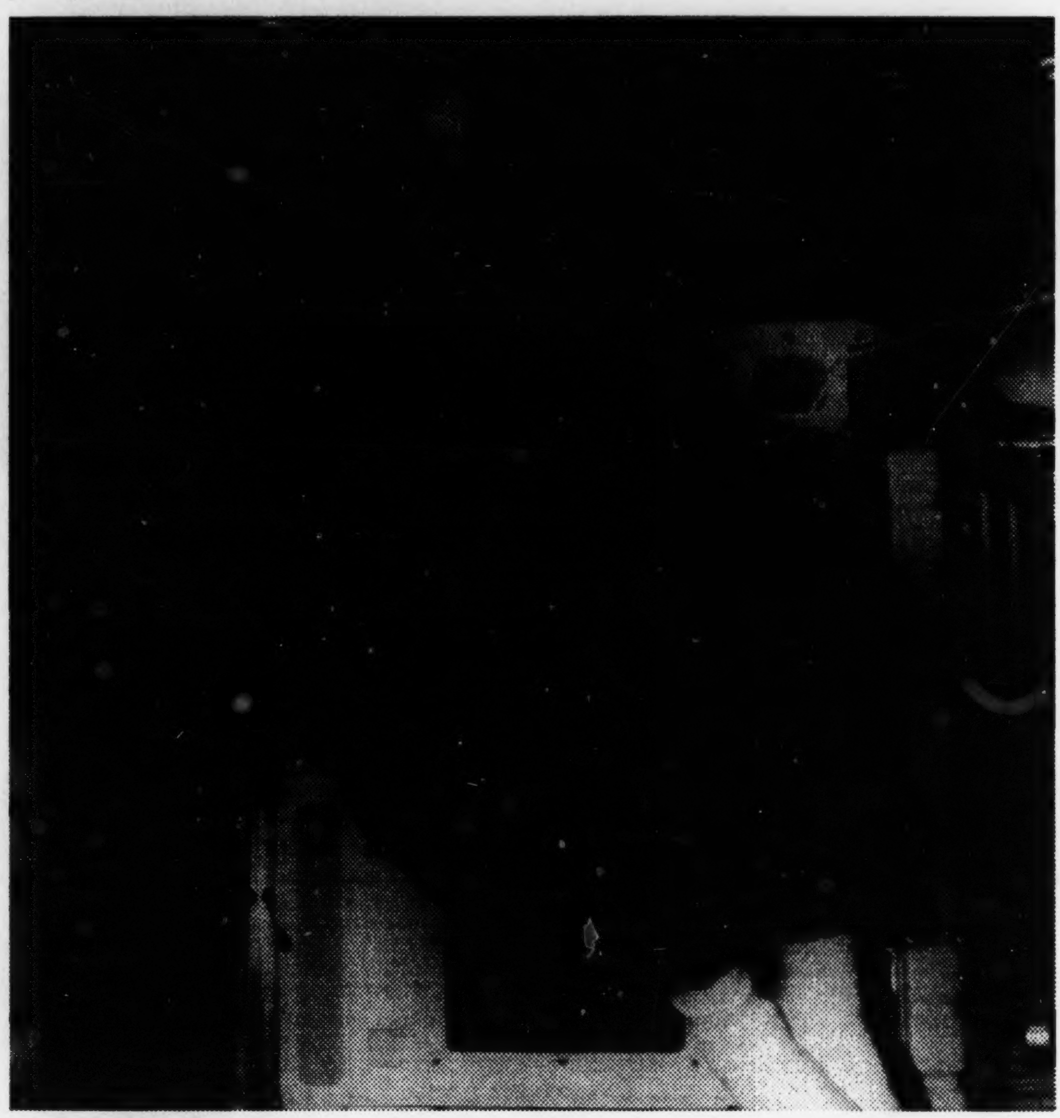
An astronaut floats through the middeck with two cameras. (NASA Photo)

Creative Movement

BACKGROUND NOTES

In outer space, you can float the way you can float in water. It means somersaults and other actions are very easy and a lot of fun. Astronauts can move in any direction— forward/back, left/right and up/down. You can dance upside-down with your partner!

In a space suit, you are restricted in your movement because of the air pressure inside and the design of the suit. But you can still float around in any direction.

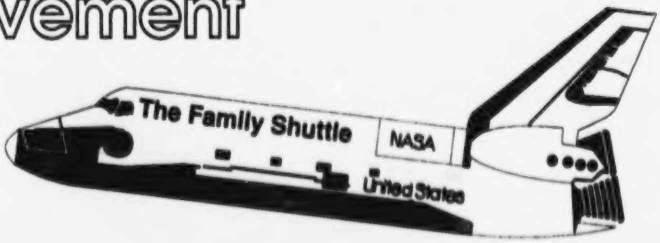


Somersaults are easy to do in the weightless envirnment of outer space. (NASA Photo)

Creative Movement

NOTES

Creative Movement



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In a spacesuit, you are restricted in your movement because of the inflated pressures and design of the suit. But you can still float around in any direction.

Astronaut McCandless floats freely outside the shuttle, untethered. (NASA Photo)

ACTIVITY

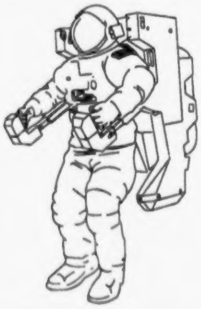
Children have experienced a number of air and space-adventure activities which lend themselves to creative movement. Creative movement is a natural extension of the stress and exercise units. Try these activities and encourage your children to express themselves through body movement. Suggest that they use their imagination while they move.

1. Simulate a space shuttle countdown with the children in a crouched position. Let children gradually stand up as they countdown and jump as they lift-off. Encourage children to stretch, twist and rotate as they approach orbit. Ask them to move about as if they were a space shuttle floating in outer space.

2. Ask children to walk on the Moon or Mars. They will have to use exaggerated steps and slow movements because they weigh much less and can not move as fast as they can on Earth.

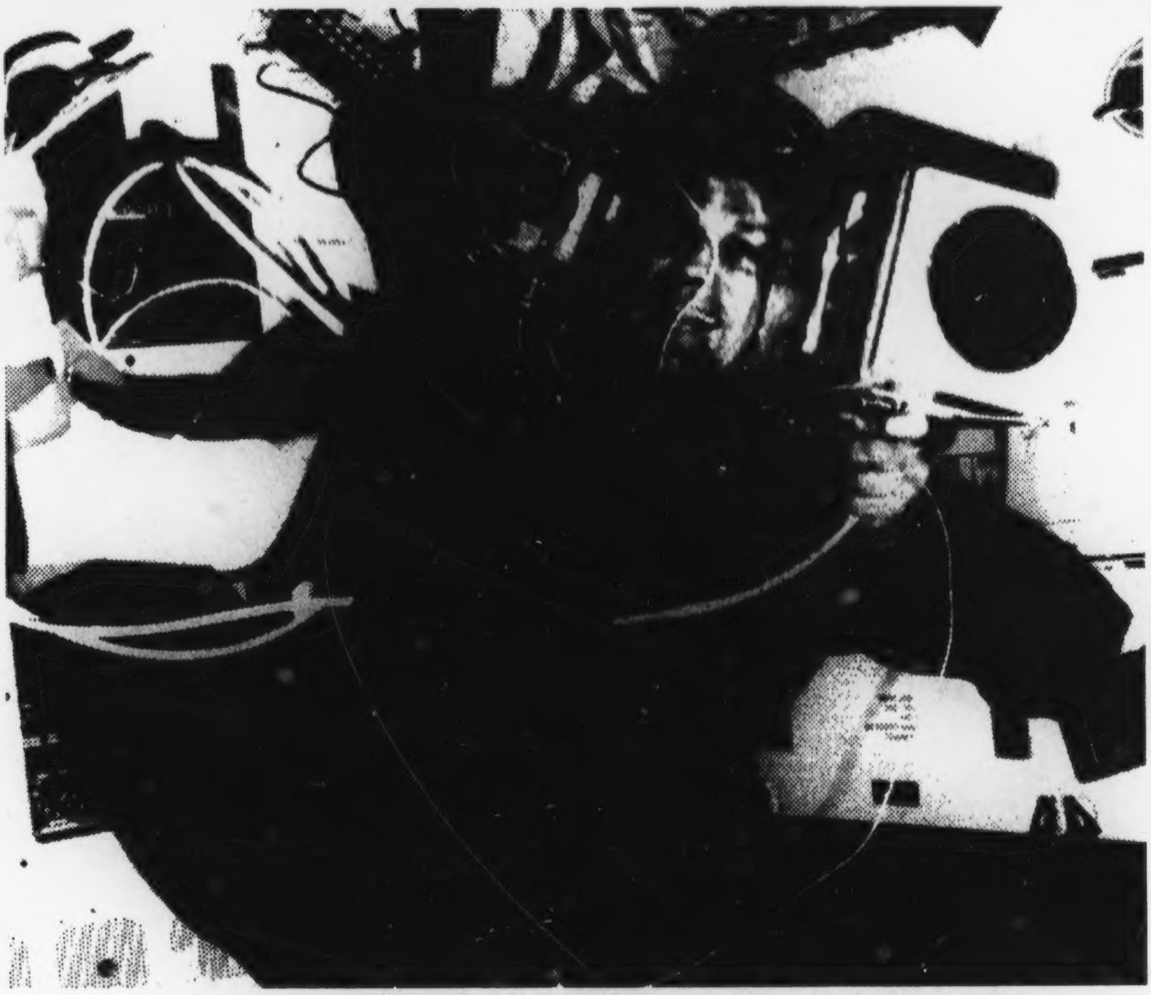
MATERIALS NEEDED

Light and airy music.



The MMU provides astronauts with complete freedom of movement outside the spacecraft. (YAC Illustration)

Creative Movement



An astronaut floats throught the middeck with two cameras. (NASA Photo)

Want To Give Your Children More Space To Grow?

1. Explain that an orbit is a "squeezed-in-the-middle circle" and let children float around in orbit as you play light and airy music. Encourage children to hum, buzz or purr the way they think a shuttle may sound in flight.

2. Let them pretend to be clouds moving in the sky. Try being clouds during a tornado, a thunderstorm and on a calm, peaceful day.

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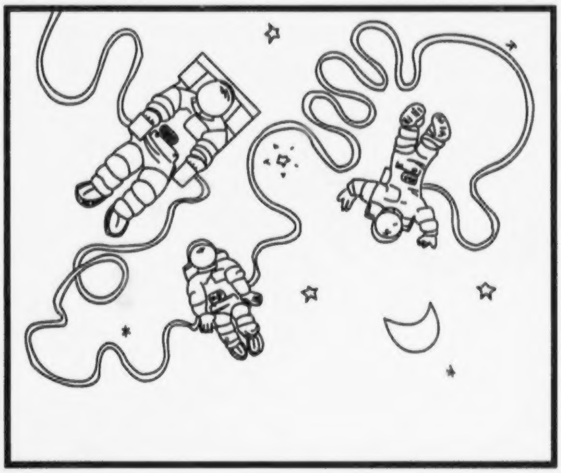
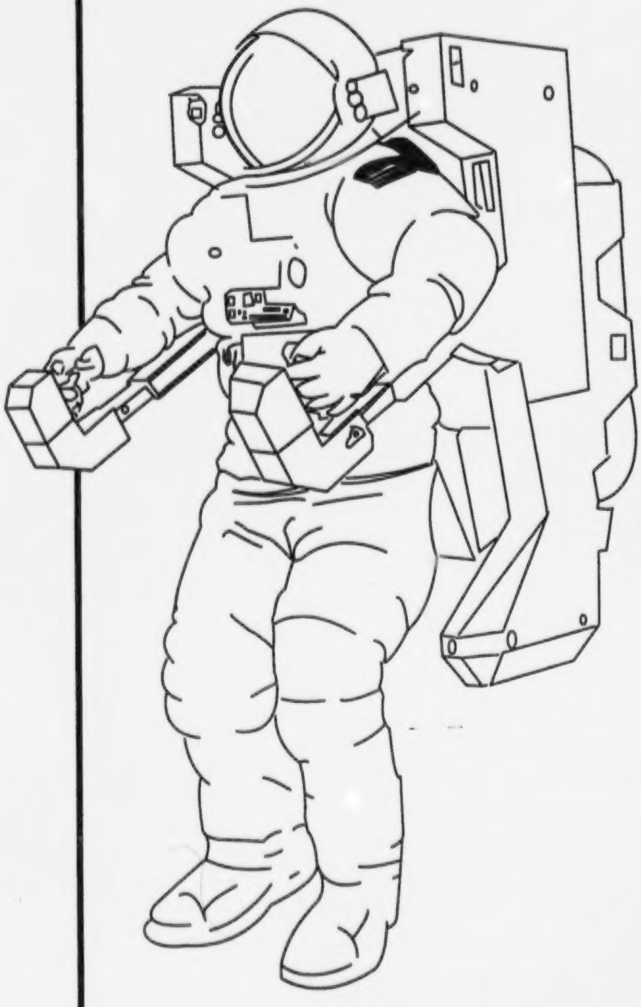


Appendices



(YAC Illustration)

Play For Children

Preschool Astronauts At Play

You are a parent of a preschooler or a preschool teacher. What did you think when you heard about the *Living in Space* curriculum enrichment module? Did you say, "Wonderful! Our kids need to know more about science."? Did you worry that thinking about outer space might be very hard for preschoolers? Then you are like most of the parents and the teachers who tried out the curriculum in Florida.

Those parents and teachers found out that the children enjoyed the activities. The parents and teachers also found out that some of the scientific ideas are hard for preschoolers to grasp. But as they watched the children's play and listened to them talk, they felt the children had a good beginning for understanding outer space.

A good beginning is what the preschool years are all about. Using all senses, the child feels, tastes, smells, pushes, pulls, looks, listens, explores and investigates everything possible. Then comes play! Play is an activity where the child uses and has fun with what he or she knows from other activities.

For many years, early childhood teachers have talked about the importance of play. "Children learn through their play," they say. But critics, who do not know young children very well, often insist that children should be "learning basic skills" rather than "just playing."

Recently, many studies of preschool children playing have begun to reveal what happens when children "just play." Play serves as a medium for self-assertion and self-expression. It also serves as a medium for trying out cognitive possibilities. In play, a child can become an astronaut or operate mission control and work out solutions to problems as they arise or as the other children invent them.

(NASA Photo)

In play, someone has said, children can function as though they are a head taller than they really are. Play cannot take the place of the knowledge the child gains through direct contact with things and with people. Children learn by acting on their world and by being told or shown. Play provides the opportunity to make what they have learned a part of themselves. Play enables children to use what they have learned in many new and different ways.

The *Living in Space* curriculum module offers many opportunities for children to learn from their own activity, to learn from what teachers or parents tell them and to learn from pictures, stories and audio-visual materials. Equally important are the opportunities the children have for play.

To make opportunities for play meaningful to the children, parents and teachers may want to think about the following characteristics of play.

Characteristics Of Play

1. Play is a "do-it-yourself" activity. Children play because they want to. For example, when a teacher had helped a girl to put a puzzle together, she said to her, "Now you have learned to do that puzzle. Would you like to learn to do another?" The girl responded, "No, but I would like to play with it."

Adults cannot make children play but they can set up a classroom that invites play. Given floor or outdoor space and the right props, children learning from the *Living in Space* units are likely to play "spacecraft." However, the play reflects what the children want to do and what the children understand. So the play may not conform to what the adults expect.

2. In play, children's goals frequently shift. Often they are more interested in the various ways of getting to a goal than they are in arriving at it.

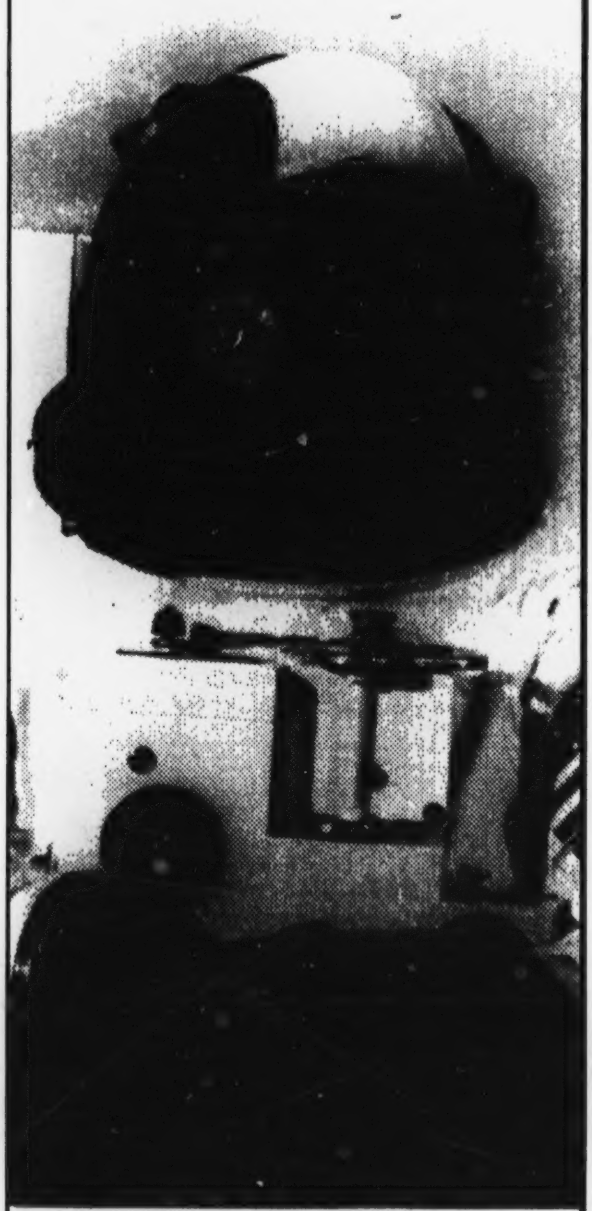
When they play "spacecraft," they may not move steadily from launch to re-entry. To them, re-entry may be less important than pretending to sleep on board. Sleeping may remind some of a bus trip they took. Suddenly the spacecraft becomes that bus. To some adults such shifting in the play seems flighty. But those who have studied children's play call such shifting, "flexibility." Children who have tried out various ways of getting to a goal in their play are able to solve problems better than children who have not played in such a manner.

3. Play is only "make-believe." The child treats playthings as though they were something else, and each child becomes someone else. A bleach bottle or milk carton stands for a space helmet, a box becomes a computer, the child, an astronaut. When children learn to read, they have to understand that the printed words stand for, or symbolize, something else. People who have studied children's early reading, their beginning mathematics and their reasoning have found that their abilities are related to their play. When we deny children opportunities to make-believe play, we also may deny them opportunities to become good readers or even scientists, mathematicians or creative artists.

4. In play, children make their own rules. Of course, the adults have rules about not hurting others or destroying things, but within the play the children decide how it is to go. They decide what a child has to do and say to become part of the play. They work out ways of agreeing on themes for the play and ways of resolving differences. We are just beginning to understand how complex the children's rules are. Studies where observers carefully watch and listen to children's play show how important it is. Social competence, the ability to get along with other people in many different situations, has it roots in preschool play.

5. In play, as experts define it, the child's self, rather than the play things, is in the foreground. The girl with the puzzle, described above,

(NASA Photo)



(NASA Photo)

seemed to be saying, "I want to do everything I can with these pieces of wood." Playing differs from exploration. In exploration, the child seems to say, "What is this thing and what can it do?"

A good preschool program includes a balance between "play" and "exploration." In exploration, the child becomes familiar with new objects. In play, the child creates new uses for old or familiar objects.

What Parents And Teachers Can Do About Play

Preschool classrooms are busy places and so are the homes where the children live. Parents and teachers are busy people. The *Living in Space* curriculum suggests many things for them to do. Doing something about children's play means doing still more but it is also important. And it can be rewarding and even fun!

1. Adults set the stage for children's play. They provide a place for the play. Children need to know the space that is theirs for their play. They need to have ample time to play. It takes time for them to decide on the theme for the play. And they need lots of time for the repetitions and variations that go with good play.

Children also need props for play. Adults can, for example, see space helmets and backpacks are available. Younger children seem to need props that are quite realistic. Older children, four and five-year-olds are better able to use their own imaginations. They can make a block serve as a walkie-talkie or the highest point on a mountain.

2. Adults watch and listen to children's play. Through such observation over time, they learn what the play means to the children. They can ask themselves whether the children's play has the features described above. If not, why not? What can they do to enrich the play? Do the children need more space, different props or more time?

Through observation, the adults can pay attention to the content of the children's play. Does it reflect the learning activities that have been provided? What themes does it reveal? Preschool children have always played out the things that are closest to them: family activities, such as cooking, eating, sleeping, going to work, fighting or celebrating. These themes and the children's feelings about them often color their play.

Through observation, the adults can see how the children are learning to get along with one another. How do they get accepted into the play? How do they decide what to play? How do they assign the roles to be played?

Through observation, the adults can also learn about the children's thinking. They can see how children's play is different from the way they learn when they are shown or told something. Play is also different from the way they learn when they observe or explore. Play is a way for the children to practice what they know. It is a way for them to develop new ideas and new understandings. Adults who observe the children's play over time can note such changes in children's thinking.

3. Adults sometimes share in the children's play. Since the children's play is what they want to do, it is no longer play when the adults take it over. But adults who know children well can sometimes help the play along by becoming somewhat involved in it. For example, an adult might ask a child, "Could you use this box to hold those?" Or an adult might suggest a role for a child on the edge of the play. For example, "It looks like you need someone to hold that steady. Perhaps Judy could do that for you." Or, "Yesterday Harry and Samantha put their sleeping bags in that corner. Would you like to try that?"

(NASA Photo)

(NASA Photo)

Conclusion

Play is what makes the preschool different from a school for older children. The *Living in Space* curriculum, enrichment module offers children an opportunity to learn about ventures into outer space. The children encounter, at their own level, some of the scientific and mathematical concepts and skills that are basic to the Space Program. Through play the children can practice, relive, refine and enjoy these basics. They, assisted by their parents and their teachers, will have made a good beginning.

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Math & Science For Preschoolers

Science And Math For Preschoolers

The *Living In Space* curriculum enrichment module has been designed to provide a special emphasis on an exciting frontier of our world. Young children share the eager interest of adults in the nation's space exploration program. Yet the concepts underlying an understanding of our universe and the technology we are using to search for the revelation of its mysteries are complex. Young children understand little of weightlessness or of weight or matter. They do not conceive of gravitational forces. Many preschoolers will know about air only when it is in motion, as wind, for that is when they can feel it on their cheeks or as they watch the resulting movement of paper in their hands. Young children learn through their senses.

At the same time, young minds are growing, seeking, engaging their everyday environments in the search for information, explanations and answers. The quest extends throughout the day into the nooks and crannies of home, school, neighborhood and community. Young children are curious and active. It is up to parents and teachers to meet the intense drive-to-know with experiences which give information without entirely satiating, to provide challenge without threatening and to extend the scope of those young minds without discouraging them through failure, drill or judgements about wrong answers. To challenge a child means sharing ideas she/he does not yet understand fully or which may be a totally new experience. To extend a child's mind may mean opening up a new area of thought or deepening a child's involvement in an already lively interest.

(NASA Photo)

Use of Module

How can teachers create challenging experiences in the preschool? First of all, remember what "developmentally appropriate" really means: that the environment, the materials and the expectations of adults are in line with child-development knowledge about children this age and are right for each individual child at this time in his/her life. Second, remember how young children learn best:

- From real experiences with actual objects and phenomena.

- By starting "where they are" with experiences which relate to what they know already, by picking up where they "left off" in their thinking, yesterday, last week or just a few minutes ago on the playground .

- Through their own seeking, questioning, doing and especially through their own play and playful activities.

- When sharing the enthusiasm of adults whom they like and respect enough to copy their behavior and respond to their suggestions.

- By being encouraged to talk about their activities with adults and other children.

- By having their comments, questions and solutions responded to positively and respected.

- By having plenty of time and opportunity to repeat, re-look and redo as often as they like at their own pace and by being encouraged to talk about it with adults and other children.

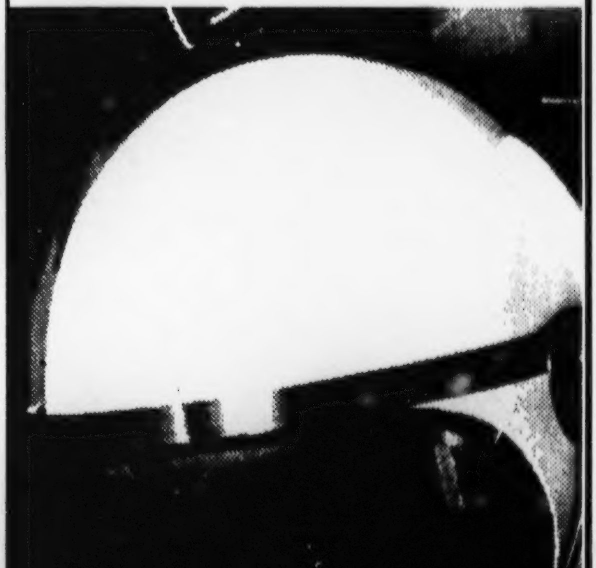
In providing this module, we have been aiming particularly at the skills and understandings which strengthen children in ways we could call beginning science and math. We know that young children do not develop in science today and math tomorrow. They grow "all at a piece," as whole human beings. To take full advantage of that way of nature, we have developed this special, integrated, curriculum module. Each unit contains suggestions for a variety of activities to be done with individuals, small or (occasionally) large groups of children. Each unit may stretch over many days to keep up with the progress of the children. Ideas from more than one unit could be in progress for different children at the same time.

You will find that the integrated curriculum module is not separated into "science" or "math" and that some of the ideas involve discussion and learning new words - which is language development - or understanding occupational roles, as in social sciences. Whatever the school category, the learning takes place in whole children as they interact with each other, with adults and with the environment which the adults have planned and set up carefully, with materials ready to extend and intrigue young minds and build skills into young bodies.

Living In Space should also be integrated into and fit with your other plans for children's education throughout the year. In your planning of science experiences, for example, you will still want to help your children observe ladybugs and pour water through a sieve to see if it goes faster that way. The present module is designed to make your science and math activities even better to enrich your curriculum. It provides some exciting and new experiences for parents and teachers, as well as children.

Use those ideas in ways appropriate for the children you know and in ways appropriate for their development and their individual interests. You will find that some children, especially your three-year-olds, will not be turned on by aerospace dramatics; they are still pretending to be parents, babies or kittens. Some children, on the other hand, will be eager to play astronaut throughout many days, asking for the material again and again.

(NASA Photo)



(NASA Photo)

The Development of Science and Mathematics in Early Childhood

Developmentally, a group of preschool children represents wide ranges of readiness and accomplishment. The ages may go from young three-year-olds to children who are almost six, as is common in current Head Start groups, for example. The range of skills and concepts, according to norms and other age-related research findings, is likely to be much broader. A teacher needs to be ready for children who think like two-year-olds, as well as children who may have some second-grader interests and abilities.

What can we expect from children? Developmentally, even very young children have a grasp of space relations, that is the relations of their bodies to the space they occupy. Understandings of directions may begin with "out-from-my-body", too. There are several more of these basic conceptual achievements which most preschool curriculum materials assume children have acquired. Can you assume that the children in your group have developed an understanding of these foundations? Has the child acquired:

1. Object permanence - the realization that an object exists whether within one's grasp or view or not, thus the object is understood as a thing by itself, separate from other objects, oneself and from the space which surrounds it.

2. Conservation of form of a solid object - that the object does not change shape because something else happens to it such as being dunked in water or hidden from view.

3. The distinguishing of oneself from space, objects and other persons. One's self is known as an entity with the power of movement through space on one's own. One's self is known to have some ability to affect changes by moving objects and substances.

4. A sense of pattern and rhythm, which is pattern through time. Patterns are regular, repeated or repeatable configurations of objects and/or sounds. The patterns seem to set the stage for children's sense of order, of objects belonging to a set because of shared characteristics. Once experiences suggest a pattern, a child can predict or hypothesize results on the basis of past experiences.

These basic developments pave the way for other cognitive and social growth which have special significance for science and math learning. During the first six years of life, children learn to observe and distinguish similarities and differences in objects, events and phenomena. They use their senses, gain control over them and are able to focus attention with patient alertness—if they are interested. They are beginning to group, or form sets, and to classify based on ideas which they can identify as they grow older. Children will begin to recognize the patterns in sequential arrangements or events, as they string beads or arrange things in order by size. They may grasp the early forms of ordinal numbers, "first" and "last." Most children, by kindergarten, may have memorized some counting sequences and are likely to achieve an understanding of "one-to-one correspondence," the idea one item gets one label, tag or numeral and only one. Children also begin to understand number concepts, that a number is a characteristic of objects regardless of what the objects are. They are able to handle small numbers in totaling and can answer a "How many?" question if there are not more than five or so. Children are also learning to use language to describe their observations, citing properties such as size, shape and color. They can learn technical names like "orbiter" and words for nature's events, such as "gibbous Moon" or "nimbus cloud," just as they learn the name of a typewriter or kiwi fruit. They learn how to ask questions.

(NASA Photo)

(NASA Photo)

How Young Children Think

The thinking processes of preschool children are different from those of older children or adults. In addition, thinking must be an individual process. Each child puts together his or her memories, associations, sensations and observations to build his or her own thoughts and concepts. Other people can give information, but only the child can make sense of information for herself or himself. The unique processing of information is characteristic of young children as they develop thinking skills.

Teachers using this aerospace curriculum module will encounter these features of preschool thinking with every discussion. Young children are likely to:

1. Focus on a single attribute, element or relationship at a time. A child may insist that his/her helicopter toy comes down fast because he/she dropped it from "...way up high," disregarding rotor action completely.

2. Observe only one or two properties of an object at a time, even if he/she sees the object at different times. The shuttle toy or photograph may be always identified as "that thing with the flag."

3. Observe and describe the beginning and ending condition of a change phenomenon, but are not likely to think about the in-between stages and transformations. For example, children will understand that water makes ice, but do not focus on gradually freezing slush, even if they see it. Wise teachers continue to draw their attention to processes and cycles.

4. Stick to an explanation. Once a change is made, it is hard for young children to understand that it is reversible. (Water makes ice or ice makes water, but not the same ice!)

5. Seek explanations for their own ideas based on partial understandings, especially on part of a process which they can observe. This intuitive thinking is very important, if not always accurate. Young children will, as science educators point out, "form naive hypotheses." They offer reasons, estimates and guesses based on what they know.

These thinking processes of preschoolers will be illustrated over and over in the play and discussions among children and in responses to adults during these curricular activities. The thinking and problem-solving processes of young children are not wrong or in error—they are growing. Wise adults, rather than dwelling on mistakes, will arrange experiences which demonstrate correct or more complete information. These adults also know that sometimes a child is simply not ready for a concept. More importantly, wise adults will approach discussions of aerospace phenomena with open minds, ask open-ended questions which allow children to think and speculate and show readiness to accept children's ideas.

Young children pretend with enthusiasm. They learn a great deal about themselves and their social world through dramatic play. But in trying to construct explanations for themselves about the world, they may not distinguish between what is real and what is magic or imagined. Fantasy and reality take a long time to disentangle in children's minds. In science and mathematics activities, therefore, it is important that teachers be specific about causes and conditions. A photograph of the Earth taken from outer space is exactly that. If you call it by its metaphorical title, "The Big Blue Marble," children will wonder why you do not have that marble in your hand to show them. It is important not to present the natural phenomena of the sky or aerospace technology ideas—or any scientific explanations, for that matter—as magic or beyond belief. The accomplishments of space science and new insights about our universe are indeed "fantastic," but they are real.

(NASA Photo)

(NASA Photo)

Children and the Scientific Method

Young children and career scientists have much in common. They go about the work of finding answers and seeking solutions in much the same basic way. But, first, they seek the problems. Young children are curious. Unless they are preoccupied, they explore and discover. When they find something of interest, they investigate. They think about it. They poke and stare. They observe with all their senses alert. They think about it. Then they experiment, testing the properties, functions and relationships. They experience results and they think about them. They accept what happens because it happens to them. They may even ask themselves why it happened, if they are older and more sophisticated thinkers.

Young children will usually communicate their findings, that is, they tell someone what happened. As they are doing so, they are thinking some more. They may record their results in painting or drawing. They will learn that their findings are worth recording when someone who can write lists their ideas, charts their observations and records their narrative of the process of discovery. Now they are collecting and preserving data.

Young children are rarely satisfied with doing an activity once or having only one turn. That is an important characteristic. Opportunities to repeat, to verify results, to think again should be provided to young children. Then they may repeat exactly or try it differently. Both involve essential science.

All these activities describe the basic elements of the scientific method and of a problem-solving mode which can be applied every day by children and adults in many ways. Opportunities to experience these processes are built into every unit of this curriculum.

Enjoying It

Some children will understand, some will remember and some will be intensely interested in prolonging every activity. Others will participate and move on to areas of the classroom where their favorite materials continue to offer challenge. Hopefully, each child will enjoy some of these most basic aerospace experiences. Perhaps every child will gain, as we hope, a deeper appreciation of the scope of science.

Bess-Gene Holt

Bess-Gene Holt
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(NASA Photo)

Resource Bibliography

More Resources

This list offers potential reading resources for classroom and home use. These books have not been reviewed by the Young Astronaut Council and therefore no recommendation for use is implied. Although some books may be inappropriate as to age-Level, they may be valuable for picture content only.

Books are coded for origin of source, publisher, published date and appropriate age-level when such information was available.

This list has been compiled from NASA, U.S. Department of Education, Florida Head Start Programs, Smithsonian Air and Space Museum Shop, publishers and the District of Columbia's Martin Luther King Children's Public Library A to Zoo: Subject Access to Children's Picture Books and Subject Guide to Children's Books in Print 1986-1987. Each entry is referenced to the source. See code below.

This Resource Bibliography is arranged by the three major curriculum categories alphabetically by title.

CODE:

E =U.S. Department of Education, Educational Research Information Center

N =NASA Resource List, Elementary School Aerospace Activities

F =Suggested by Florida Head Start teachers who field- tested the curriculum.

S = Smithsonian Air and Space Museum Shop

L =District of Columbia Martin Luther King Children's Public Library A to Zoo: Subject Access to Children's Picture Books and Subject Guide to Children's Books in Print 1986-1987.

P = Submitted by Publishers

More Resources

WHAT'S IN THE SKY?

Adventures in the Solar System. Geoffrey Williams & Dennis Regan. Price Stern. 1986. 64p. ISBN: 0-8431-1552-1; 0-8431-1553-X (E,F)

THE ADVENTURES OF Q'BERT. John Robinson. Parker Brothers. 1983. 32P. gr. 2-5 ISBN: 0-910313-12-1 (out of print) (E,F)

Air Around Us. Tony John Chandler. Doubleday. 1969. gr. primary-intermediate-upper (N,F)

Alex Remember. Helen V. Griffith. Greenwillow Books. 1983. (L,F,D)

Amos and the Moon. Jan B. Balet. (L,F)

Amy Goes to the Moon. Cornelia Shields. Childrens Art. 1976. gr. k-6 ISBN: 0-89409-006-2 (E,F)

Anansi the Spider. Gerald McDermott. (L,F)

The Angry Moon. William Sleator. Little. 1970. gr. primary-intermediate (N,F)

Anna and the Moon Queen. Jenny Vaughn. (F)

Astronauts on the Moon: The Story of the Apollo Moon Landings. Stanley Hendricks. Hallmark. 1970. gr. primary intermediate (N)

Astronomy: A New True Book. Dennis Fradin. Childrens Press. 1983. 48p. gr. k-4 ISBN: 0-516-01673-3 (S)

Astronomy Today. Dinah L. Moche. Random House. 1982. 96p. gr. 5+ ISBN: 0-394-84423-8 (P)

Ayu and the Perfect Moon. David Cox. Salem House Publishers. 1984. 32p. gr ps-k ISBN: 0-370-30533-7 (E,F)

Barrels to the Moon. Harold Benson. Putnam Publishing. 1982. 32p. ISBN: 0-698-20551-0 (out of print) (E,F)

A Bear in the Air. Leslie Williams. (L)

The Bears' Almanac. Stan Berenstain. (L)
The Berenstain Bears on the Moon. Stan & Jan Berenstain. Random House. 1985. 48p. gr. p-3 ISBN: 0-394-87180-4 (P,S)

Beyond the Milky Way. Cecile Schoberle. Crown. 1986. 32p. gr. ps-3 ISBN: 0-517-55716-9 (E)

Big Bird's Book about the Earth and Sky. Rae Paige. Western Publishing Golden Press. 1985. 45p. ISBN: 0-307-15821-7 (F)

The Big Dipper. Franklyn M. Branley. (L)

The Bird and the Stars. Paul Showers. Doubleday & Co. 1975. (F)

Bobby Bear's Rocket Ride. M. O. Helmrath and Barlett, J. L. Oddo. 1968. gr. ps-1 ISBN: 0-87783-008-8

Book of Greek Myths. (Helios, Sun and Seiene, Moon). Ingri and Edgar Parin D'Aulaire. Doubleday. 1962. (F)

A Book of Outer Space For You. Franklyn M. Branley. Crowell Publishers. 1970. gr. primary-intermediate-upper (N)

A Book of Planets for You. Franklyn M. Branley. Scholastic Press. 1972. gr. primary-intermediate (N,F)

A Book of Satellites for You. Franklyn M. Branley. (F,L)

The Bossy Hawaiian Moon. Sabine Ehlers. Hawaiian Serv. 1980. 32p. gr.ps-1 ISBN: 0-930492-15-3 (E)

Cabbage Moon. Jan Wahl. (L)

Charlie Brown's 'Cyclopedia #8: Stars and Planets. Funk and Wagnalls, Inc. (F)

More Resources

Charlie Brown's Second Super Book of Questions and Answers About the Earth & Space. Charles M. Schulz. Random House. 1977. 160p. gr. 3-5 ISBN: 0-394-83491-7 (P)

Christmas Moon. Denys Cazet. Bradbury Press. 1984. 32p. gr. ps-2 ISBN: 0-02-717810-2 (E)

The Church Mice and the Moon. Graham Oakley. (L)

The Circle Time Book for Holidays and Seasons. Liz and Dick Wilmes. Building Blocks. 1984. (F)

Climate. Julian May. Follett. 1968. gr. primary-intermediate (N)

The Cloud. Deborah Kogan Ray. (L)

The Cloud Book. Tomie DePaola. Holiday House. 1975. gr. primary-intermediate (N,F,L)

Come Out Shadow, Wherever You Are! Bernice Myers. Scholastic Book Service. 1970. (F)

Comets. Kate Petty. Franklin Watts. 1984. (F)

Comets, Asteroids, and Meteors: A New True Book. Dennis Fradin. Childrens Press. 1984. 48p. ISBN: 0-516-01723-3 (S)

Communications Satellites: Message Centers in Space. Bernice Kohn. Four Winds. 1975. gr. primary-intermediate (N)

Conquest of the Moon. Felix Sutton & Alvin Maurer. (F)

The Daughter of the Moon and the Son of the Sun. G. Yudin. Imported Publications. 1976. ISBN: 0-8285-1129-2 (E)

Dawn. Uri Shulevitz. (L)

Dawn Darling. Caroline Jackson. Belvedere Press. gr. p-3 ISBN: 0-911-05700-5 (S)

The Day the Sun Danced. Edith Thacher Hurd. (L)

The Day the Sun Disappeared. John Hamberger. (L)

The Day We Saw the Sun Come Up. Alice E. Goudey. (L)

Discovering the Stars. Laurence Santrey. Troll Associates. 1982. (F)

Do You Know About Stars? Mae Freeman. Scholastic Book Service. 1970. (F)
Dreams. Peter Spier. Doubleday. 1986. (F)

Earth and Sky. Mona Dayton. Harper & Row. 1969. (F)

Earth and Stars Fact Book. Arthur Snider. (F)

Eclipse: Dark in Daytime. Franklyn Branley. Thomas Y. Crowell Co. 1973 (F,L)

Ellsworth and the Cats from Mars. Patience Brewster. (L)

Evening Gray, Morning Red. Barbara Wolff. Macmillan Publishing Co. 1976. (F)

Emily Emerson's Moon. Jean Merrill and Ronni Solbert. Little, Brown. (L,F)

Exciting Outer Space. Christopher Carrie. Binney and Smith. 1981. 48p. gr. k-4 ISBN: 0-86696-036-8 (L)

The Exploding Suns. Christopher Black. Dell. 1984. gr. k-6 ISBN: 0-440-42473-9 (E,L)

Exploring the Planets. Jonathan Rutland. Warwick Press. 1978. (F)

The Family of the Sun: Our Solar System. Ruth A. Vincent. Vantage. 1978. ISBN: 0-533-03003-X (out of print) (E)

More Resources

The First Book of the Earth. Mildred Waltrip. (F)

First Poems of Childhood. Tasha Tudor, ed. Platt and Munk. 1967. (F)

Follow the Sunset. Herman Schneider. (L)

4 in 1 Aerospace Coloring Book, Book ne (not to be used as a coloring book). Carol Heiderman. Civil Air Patrol. 15p. (P)

Our Friend the Sun. Janet Palazzo. (L)

Galaxies. Isaac Asimov. Follet. 1968. gr. primary-intermed. (N)

The Girl and the Moon Man. Jeanette Winter. (L)

Good Night. Elizabeth Coatsworth. (L)
Goodnight Moon. Margaret Wise Brown. Harper. 1947. (F)

Grandfather Twilight. Barbara Berger. Philomel Books. 1984. For very young child. (D)

The Great Book of Things in Space. (F)

Halley's Comet: A New True Book. Dennis Fradin. Childrens Press. 1985. gr. k-4 48p.

Harold's Trip to the Sky. Crockett Johnson. Harper Junior Books. 1957. gr. k-3 ISBN: 0-06-022986-1 (L)

Hello World. Barbara Stewart Jones. Pittman Learning Corporation. 1982. (F)

Hi, Clouds. Carol Greene. (L)

Hiawatha. Henry Wadsworth Longfellow. Dial. 1983. (F)

How the Rabbit Stole the Moon. Louise Moeri. Houghton Mifflin. 1977. 40p. gr. K-3 ISBN: 0-395-25765-4 (E)

How the Sun Was Brought Back to the Sky. Mirra Ginsburg. Macmillan. 1975. (F,L)

How the Sun Made a Promise and Kept It. Margery Bernstein. (L)

I Feel the Same Way. Liliam Moore. Scholastic Magazine. 1966 (F)

I Want to Do Experiments: Earth and Sky. Childrens Press. 1974. (F)

I Want to Know About a Flight to the Moon. Alfred M. Worden. Doubleday. 1974. gr. primary-intermed-upper (N)

If I Came from Mars: Si J'etais Martien. Jacques De Roussan. Tundra Books. 1977. gr. k-4 ISBN: 0-88776-032-5 (E)

In the Middle of the Night. Aileen Fisher. Thomas Y. Crowell Co. 1965. (F)

It Looked Like Spilt Milk. Charles G. Shaw. Harper &Row. 1947. (F)

Joshua and the Magic Fiddle. Janosch. (L)
Journey into a Black Hole. Franklyn Branley. Crowell Jr. Books. 1986. 32p. gr. ps-3 ISBN: 0-690-04543-3

Journey to the Moon. Erich, Fuchs. Delacorte Press. 1970. 32p. gr. ps-3 ISBN: 0-440-042771-1; 0-440-04278-X (out of print) (E,N,F)

Jupiter. Seymour Simon. Morrow & Co. 1985. 32p. gr. ps-3

King of the Mountain. Bill Martin, Jr. Holt, Rinehart and Winston. 1970. (F)

Learn with Moonbird Solar System. Sally McNulty. Rourke Enterprises, Inc. 1984. (F)

The Legend of the Milky Way. Jeanne M. Lee. (L)

More Resources

Legends of the Sun and Moon. Eric & Tessa Hadley. Cambridge University Press. 1983. 32p. ISBN: 0-521-25227-X (E)

Lemon Moon. Kay Chorao. Holiday House. 1983. For very young child. (D)

Let's Find Out About Air. Martha & Charles Shapp. 1963. (F)

Let's Find Out About the Moon. Martha and Charles Shapp. Watts Publisher. (F)

Let's Find Out About the Sun. Janrtha & Charles Shapp. Franklin Watts, Inc. 1965. (F)

Let's Find Out About Weather. David C. Knight. Watts Publisher. 1967. gr. primary-intermediate (N)

Let's Go to the Moon. Michael Chester. Putnam. 1974. gr. primary-intermediate (N)

Let's Go to the Moon. Janis Knudsen Wheat. National Geographic. 1977. (F)

Little Bear. Else Holmelund Minarik. Harper & Row. 1957. 65p. gr. ps-3 ISBN: 0-06-444004-4 (P)

A Look Around Space. Margaret Holland & David Cooper. 1986. (F)

Look at the Moon. May Garelick. Addison. 1969. gr. primary (N)

Lottie Moon Storybook. Carolyn E. Jones. Honor Publishers. 1984. gr. ps (E)

Lullabies and Night Songs. William Engvick, ed. Harper and Row. 1965. (F)

Maggie's Moon. Martha Alexander. Dial Books. 1982. 32p. gr. ps-2 ISBN: 0-8037-5708-5; 0-8037-5721- (E,D)

The Magician of Cracow. Krystyna Turska. (L)

The Man in the Moon as He Sails the Sky, and Other Moon Verse. Ann Schweninger (ed.). Dodd. 1979. gr. ps-2 ISBN: 0-396-07741-2 (out of print) (E)

Man-Made Satellites. Willy Ley. (F)

Happy Birthday, Moon! Frank Asch. Prentice-Hall. 1982. (L,F)

Many Moons. James Thurber. Harcourt, Brace & World. 1971. (L,F,D)

Marcella and the Moon. Laura J. Coats. Macmillan. 1986. 32p. ISBN: 0-02-719050-1 (E)

Mars. Isaac Asimov. Follett. 1967 gr. primary-intermed. (N)

Mars. Seymour Simon. Morrow & Co. 1987. gr. ps-3 32p. ISBN: 0-688-06584-8 (P)

Meg on the Moon. Helen Nicoll. Harvey House. 1975. (F,L)

Midnight Moon. Clyde Watson. Putnam Publishing Group. 1979. gr. ps-3 ISBN: 0-529-05526-0; 0-529-05527-9 (out of print) (E)

The Miser Who Wanted the Sun. Jurg Obrist. (L)

The Moon. Isaac Asimov. (L)

The Moon. (Picture Library). N. S. Barrett. Franklin Watts, Ltd. 1985. (F)

The Moon. Seymour Simon (L)
The Moon. Robert Louis Stevenson. Harper Jr. Books. 1986. 32p. gr. ps-3 ISBN: 0-06 443098-7 (E)

Moon Bear. Frank Asch. Charles Scribner's Sons. 1978. For very young child (L,F,D)

Mooncake. Frank Asch. Prentice-Hall. 1983. 28p. gr.ps-3 ISBN: 0-13-601048-2 (E,F,D)

More Resources

Moon Dragon. Fran Manushkin. (L)

The Moon Explorers. Tony Simon. Scholastic. 1972. (F)
Moon Flights: A New True Book. Dennis Fradin. Childrens Press. 1985. 48p. gr. k-4 ISBN: 0-516-41940-4 (L,F)

Moongame. Frank Asch. Prentice-Hall. 1984. For very young child. (D)

The Moon in My Room. Uri Shulevitz. Harper Junior Books, 1963. 32p. gr. ps-1 ISBN: 0-06-025645-1 (out of print) (E)

The Moon Jumpers. Janice May Udry. Harper & Row. 1959. (L,F)

Moonkey. Mike Thaler. (L)

Moon Lake. Ivan Gantschev. Picture Book Studio USA. 1981. 32p. ISBN: 0-907234-08-0 (E)

Moonlight. Jan Ormerod. Lothrop. 1982. 32p. gr. ps-1 ISBN: 0-688-00846-1; 0-688-00847-X (E)

Moon Man. Tomi Ungerer. Harper. 1967. (L,F)

The Moon Seems to Change. Franklyn M. Branley. Crowell. (L,F)

Moonshadow. Angela Cater. David & Charles. 1983. 32p. gr. ps-1 ISBN: 0-575-03026-7 (E)

Moon Song. Byrd Baylor. Charles Scribner's Sons. 1982. (L,D)

Moonsong Lullaby. Jamake Highwater. Lothrop, Lee & Shepard Books. 1981. (D)

Moon, Sun, and Stars: A New True Book. John Lewellen. Childrens Press. 1981. 48p. (F)

The Moon Tonight. Gerald Hawkins. Holt, Rinehart & Winston, Inc. 1967. (F)

The Moonwalk Adventure. Margaret Friskey. Childrens Press. 1970. gr. primary (N,F)

The Moon Watching Party. Masago Aka. Silver Burdett Company. 1984. 27p. ISBN: 0-382-09138-8 (P)

Mouse and Moon. Ryerson Johnson. Hale. 1968. gr. primary (N)

My First Book About Space. Dinah L. Moche. Western Publishing Golden Book. 1982. ISBN: 0-307-11870-3 (F,S)

My First Book of the Planets. Elizabeth Winthrop. Western Publishing Golden Press. 1985. (F)

The Night Stella Hid the Stars. Gail Radley. Crown Publishers. 1978. (L,D)

The Nightgown of the Sullen Moon. Nancy Willard. Harcourt Brace Jovanovich. 1983. (L,D)

The North Wind and the Sun. Jean de La Fontaine. Franklin Watts. 1964. (L)

Ottie and the Star. Laura Jean Allen. (L)

Our Wonderful Solar System. Richard Adams. Troll Associates. 1983 (F)

Our World. Joseph Dreamy. (F)

Painting the Moon: A Folktale from Estonia. Carl Withers. Dutton. 1970. gr. primary-intermediate (N)

Papagayo, the Mischief Maker. Gerald McDermott. (L)

Peterkin Meets a Star. Emilie Boon. Random House. 1984. For very young child (L,D)

Planet Earth. Jan Burgess. (F)

More Resources

Planets. Kim Jackson. Troll Associates. (F)

Planets. Ruth Radlauer and Charles H. Stembridge. Regensteiner Publishing Enterprises, Inc. 1984. (F)

The Planets. Jonathan Rutland. Random House. 1987. 24p. gr. 2-5 ISBN:0-394-88972-X (P,S)

Planets and the Solar System. Troll Associates. (F)

The Planets in Our Solar System. Franklyn M. Branley. Crowell. 1981. 33p. gr. k-2 ISBN: 0-690-0405-3; 0-06-445001-5 (F,L)

A Planning Guide to the Preschool Curriculum. Anne Sanford, Williams, James, Overton, Kaplan Press. 1983. "Units: Things in the Sky, Sun, Moon, Stars." (F)

The Prince of the Dolomites. Tomie DePaola. (L)

The Rain Cloud. Mary Rayner. (L)

Regards to the Man in the Moon. Ezra Jack Keats. Four Winds Press. 1981. For very young child (F,L,D)

The Rice-Cake Rabbit. Betty Jean Lifton. (L)

Ricky, Rocky and Ringo Go to the Moon. Mauri Kunnas. Crown. 1986. gr. ps-2 ISBN: 0-517-56232-4 (E)

Rockets and Satellites. Franklyn M. Branley. Crowell. 1970. gr. primary-intermediate (N)

Satellites. N.S. Barrett. Franklin Watts. 1985. (F)

Satellites: A New True Book. Gregory B. Richards. Childrens Press. 1983. 48p. (F)

Satellites and Computers. Mat Irvine. Franklin Watts. 1982. (F)

Satellites in Outer Space. Isaac Asimov. (F)

Saturn. Franklyn M. Branley. Thomas Y. Crowell. 1983. (F)

Saturn. Seymour Simon. Morrow. 1985. 32p. gr. ps-3 ISBN: 0-688-05798-5 (P)

Secrets of the Earth. Dougal Dixon. Willowisp Press Inc. 1987. (F)

Secrets of Space. Ian Ridpath. Ray Rouke Publishing Company, Inc. 1981. (F)

The Shadow Book. Beatrice Regniers. Harcourt Brace Jovanovich. 1960. (F)

Shine, Sun! Carol Greene. Childrens Press. 1983. 32p. For very young child (L,D)

The Sky. Rose Wyler. Golden Press. (F)

The Sky Dog. Brinton Turkle. (L)

Sky Dragon. Ron Wegen. (L)

The Sky is Full of Stars. Franklyn M. Branley. Harper & Row. 1983. 34p. gr. ps-3 ISBN: 0-06-445002-3 (P)

Small Cloud. Ariane. E.P. DuCan May. Follett. 1968. gr. primary-intermediate (N,F)

The Solar System. Isaac Asimov. Follett. 1974 gr. primary-intermediate (N)

Someone Is Eating the Sun. Ruth Sonneborn. Random House. (F)

The Song of the Day Birds and the Night Birds. Daklow Ipcar. Doubleday & Co. 1967. (F)

Squaps the Moonling. Ursina Ziegler. (L)

Squawk to the Moon, Little Goose. Edna Mitchell Preston. Viking Press. 1974. (L,F)

Starbaby. Frank Asch. (L)

More Resources

Star Boy. Paul Goble. Bradbury Press. 1983. (F,D)

The Star Husband. Jane Mobley. (L)

The Star Rocker. Joseph Slate. (L)

Stars, Moons and Planets. Grosset and Dunlap. (F)

Stars. Isaac Asimov. Follett. 1968. gr. prim.-intermed. (N)

Stars. Melvin Berger. Coward Publishers. 1971. gr. primary-intermediate (N)

Stars. Seymour Simon. Morrow & Co. 1986. 32p. gr. ps-3 ISBN: 0-688-05855-8

Stars. Herbert Zim. Golden Book. (F)

Stars Same as the Moon. George D. Mallinson. (F)

The Sun. (Our Neighborhood Star). David J. Darling. Dillon Press, Inc. 1984. (F)

The Sun. Alice Fields. Baker and Taylor Co. (F)

The Sun. Seymour Simon. Morrow & Co. 1986. 32p. gr. ps-3 ISBN: 0-688-05857-4 (P)

The Sun and the Cloud. Kjell Ringi. (L)

Sun Fun. Caroline Arnold. (L)

Sun Grumble. Claudia Fregosi. Macmillan. 1974. For very young child (D)

The Sun is a Star. Sune Engelbrektson. Holt, Rinehart and Winston, Inc. 1963. (F,L)

Sunlight. Sally Cartwright. Coward. 1974. gr. primary-intermediate (N)

The Sun Looks Down. Miriam Schlein. (L)

The Sun, Our Nearest Star. Franklyn M. Branley. Crowell. 1971. (F,L)

The Sun, the Moon and the Stars. Mae Freeman. Random. 1979. gr. 2-4 ISBN: 0-394-80110-5 (L,P)

The Sun's Asleep Behind the Hill. Greenwillow Books. 1982. For very young child (D)

Sunshine. Jan Ormerod. (L)

Sunshine Makes the Seasons. Franklyn M. Branley. (L)

Sun Up. Alvin Tresselt. (L)

Sun Up, Sun Down. Gail Gibbons. (L)

The Sun, the Wind, the Sea and the Rain. Miriam Schlein. (L)

The Superbook of Our Universe. James Muirden. Willowisp Press, Inc. 1987. (F)

This World of Ours. Mary Reed. Golden Press. (F)

Touch the Moon. Marion Dane Bauer. Clarion - Ticknor & Fields. 1987. (E)

The Truth about the Moon. Clayton Bess. Houghton Mifflin. 1983. 48p. gr. k-3 ISBN: 0-395-34551-0 (E)

Two Crabs and the Moonlight. Tohr Yamaguchi. (L)

Wait Til' the Moon is Full. Margaret Wise Brown. Harper & Row. 1948. (L,F)

The Way to Start a Day. Byrd Baylor. (L)

Vagabl in the Clouds. Jean-Claude Marol. (L)

What Does the Sun Do? Jean Kinney. (L)

What is the Earth? Gene Darby (F)

More Resources

(NASA Photo)

What Makes Day and Night? Franklyn M. Branley. Crowell. (F)

What the Moon is Like. Franklyn M. Branley. Thomas Y. Crowell Company. 1963. (L,F)

What the Moon Saw. Brian Wildsmith. Oxford University Press. 1978. gr. ps-3 ISBN: 0-19-279724-7 (E, L)

When I Go to the Moon. Claudia Louise Lewis. Macmillan Co. 1961. (L,F)

When the Sky is Like Lace. Elinor Horwitz. J.B.Lippincott Co. 1975. (F)

Where Am I? Sylvia Caveney & Rosemary Giesen. Lerner Publications. 1977. gr. k-3 ISBN: 0-8225-1365-X (P)

Why the Sky is Far Away. Mary Joan Gerson. Harcourt. 1974. (F)
Why the Sun and the Moon Live in the Sky. Elphinstone Dayrell. Houghton Mifflin. 1977. gr. k-3 ISBN: 0-395-06741-3; 0-395-25381-0 (out of print) (E,F,L)

Why the Sun Was Late. Benjamin Elkin. (L)

Willy O'Dwyer Jumped in the Fire. Beatrice Schenk DeRegniers. (L)

The Wind. Jeanne Bendick. E.M. Hale and Company. (F)

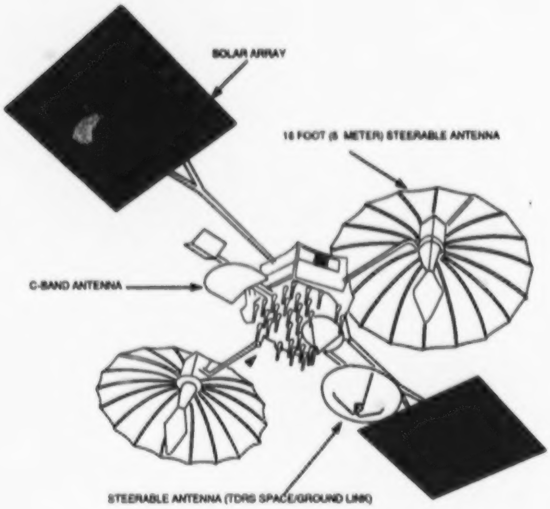
The World and Space. Childcraft #4. Field Enterprises Educational Corporation. (F)

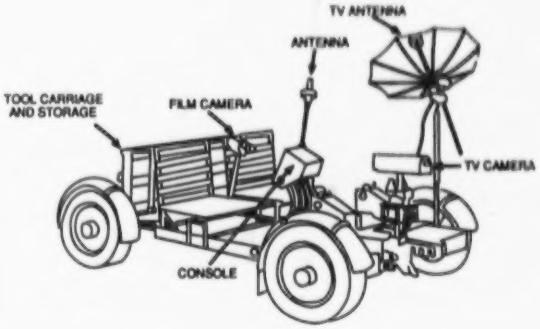
You Among the Stars. Herman and Schneider. (F)

You Will Go to the Moon. Mae Freeman. (L)

Young Scientists Explore the Sun, Moon & Stars. Linda Penn. Good Apple. 1985. gr. primary. ISBN: 0-86653-314-1 (S)

More Illustrations


SOLAR ARRAY
16 FOOT (5 METER) STEERABLE ANTENNA
C-BAND ANTENNA
STEERABLE ANTENNA (TDRS SPACE/GROUND LINK)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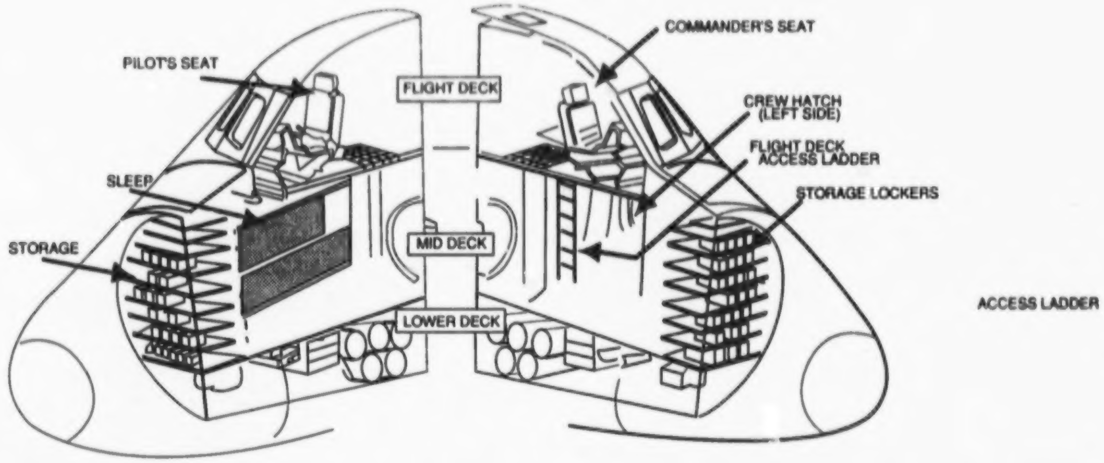

COMMANDER'S SEAT
PILOT'S SEAT
FLIGHT DECK
CREW HATCH (LEFT SIDE)
FLIGHT DECK ACCESS LADDER
SLEEP
STORAGE LOCKERS
STORAGE
MID DECK
ACCESS LADDER
LOWER DECK

The above drawings, and most of those in this publication, were derived from original art work form NASA materials and then recreated on computer. (YAC Illustrations)

More Resources

Little Plane. Michael Gay. Macmillan. 1985. gr. ps ISBN: 0-02-737500-5; 0-02-737510-2 (S)

Little Red Engine and the Rocket. D. Ross. Transatlantic Arts. gr. k-2 ISBN:0-571-05256-8 (out of print) (E)

Monkey in the Rocket. Jean Bethell. Wonder. 1962. gr k-3 ISBN: 0-448-05911-8 (out of print) (E, F)

My First Book About Space. Dinah L. Moche. Western Publishing Golden Book. 1982. (F)

The Mystery Rocket. Faye Parker. Coach House. 1961. ISBN: 0-88020-042-1 (E)

One Way is Down: A Book About Gravity. Vera Fischer. Little. 1967. gr. primary-intermediate (N)

Parachute Play. Liz and Dick Wilmes. Building Blocks. (P)

Peter and the Rocket Tea. Hazel W. Carson. 1964. (F)

The People Could Fly. Virginia Hamilton. Knopf. 1985. (F)

The Rocket book. Peter Newell. C. E. Tuttle. 1969. 52p. gr. ps-2 ISBN: 0-8048-0505-9 (E)

Rockets. Erik Berquist. (F)

Rockets. Julian May. Follett. 1967. gr. primary (N, F)

Rockets and Astronauts. Brenda Thompson and Rosemary Giesen. Lerner Publications. 1977. gr. k-3 ISBN: 0-8225-1360-9 (L, F)

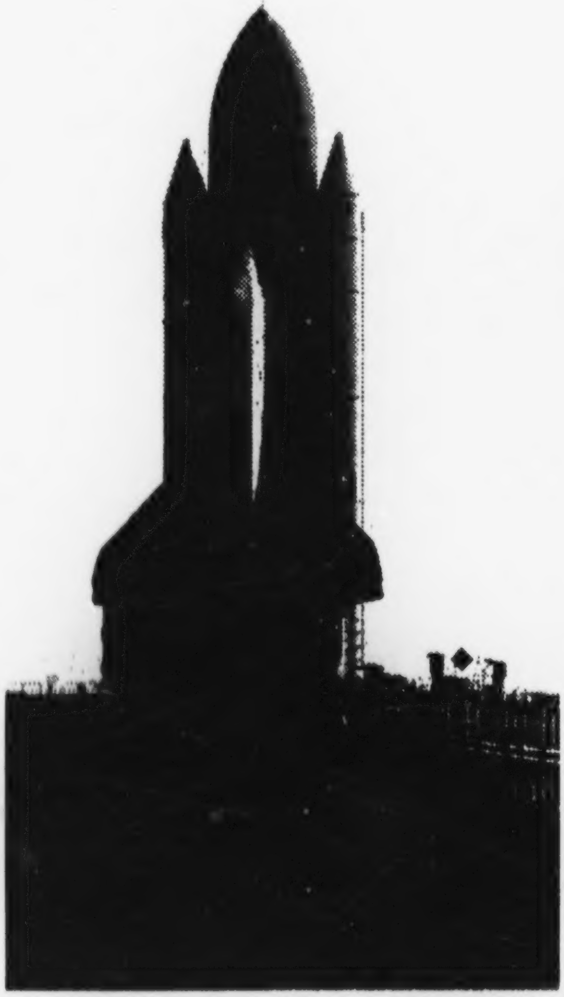
Rockets and Satellites. Franklyn M Branley. Crowell. 1970. gr. primary and intermediate (N)

Rockets Don't Go to Chicago, Andy. Jane Thayer. Morrow. 1967. gr. ps-3 ISBN: 0-688-21660-9 (out of print) (E)

Space Shuttles: A New True Book. Margaret Friskey. Childrens Press. 1982. 48p. gr. k-4 ISBN: 0-516-41655-3 (F, S)

Weight and Weightlessness. Franklyn M. Branley. Crowell. 1972. gr. primary-intermediate (N, F)

Why Does It Fly? Chris Arvetis & Carole Palmer. Rand McNally & Co. 1984. ISBN: 0-528-82074-5 (S)



(NASA Photo)

More Resources

LIVING IN SPACE

Aboard the Space Shuttle. Florence S. Steinberg. NASA division of Public Affairs. 1980. (F)

Alistair in Outer Space. Marilyn Sadler. (L)

All About Satellites and Space Ships. David Dietz. (F)

America's Space Shuttle. Lee Priestley and Julian Messme. 1978. (F)

The Ant and the Astronaut. N. Mityayev. Imported Pubns. 1973. 16p. ISBN: 0-307-11897-7 Progress Pubs. USSR. (L, F)

Arnie the Astronaut. Larry D. Johnson and Jane L. Mills. Read A. Bol. 1986. 22p. gr. ps-1 ISBN: 0-938155-02-4; 0-938155-03-2 (E, L, F)

Around the World in Ninety Minutes: The Journey of Two Astronauts. Rocco V. Feravolo. Lothrop. 1968. gr. primary (N, F)

Astronautics. Julian May. Follett. 1968. gr. primary-intermediate (N, F)

Astronauts: A New True Book. Carol Green. Childrens Press. 1984. 48p. (F, S)

Astronauts. Norman Barrett. Watts. 1986. 32p. gr. k-6 ISBN: 0-531-10002-2 (L, F)

The Astronauts. Dinah L. Moche. Random House. 1979. gr. ps-3 ISBN: 0-394-83901-3 (L, F, P, S)

Astronauts Are People. Carol Greene. (F)

Astronauts in Training. C.B. Colby. (F)

Astronauts on the Moon: The Story of the Apollo Moon Landings. Stanley Hendricks. Hallmark. 1970. (N, F)

Astronomy: A New True Book. Dennis Fradin. Childrens Press. 1983. 48p. gr. k-4 ISBN: 0-516-01673-3 (S, F)

Astronomy Today. Dinah L. Moche. Random House. 1982. 96p. gr. 5+ ISBN: 0-394-84423-8 (P)

Babar Visits Another Planet. Laurent de Brunhoff. (L)

Be An Astronaut! Bill Kaufman, ed. Random House. 1984. 8p. gr ps-2 ISBN: 0-394-86492-1 (out of print) (E, L, F)

The Berenstain Bears on the Moon. Stan and Jan Berenstain. Random House. 1985. 48p. gr. p-3 ISBN: 0-394-87180-4 (P)

The Best New Things. Isaac Asimov. (L)

Big Birds's Book About the Earth and Sky. Rae Paige. Western Publishing Golden Press. 1985. 45p. ISBN: 0-307-15821-7 (F)

Blast Off. Bruce Cassidy. (F)

Blast Off, Barefoot Bear. Richard H. Eyster. (F)

A Book of Flying Saucers for You. Franklyn M. Branley. (F)

A Book of Planets for You. Franklyn M. Branley. Scholastic Press. 1972. gr. primary-intermediate (N, F)

Buck Rogers: A Pop-Up Book. Chuck McVicker (Illus.) Random. 1980. 16p. gr. ps-3 ISBN: 0-394-84437-8 (out of print) (E)

Challenger: The Story of Guion Bluford. James Haskins and Kathleen Benson. Carolrhoda Books. 1984. 56p. gr. 1-4 ISBN: 0-87614-259-5 (F, L)

Charlie Brown's 'Cyclopedia # 7: Space Travel. Funk and Wagnalls, Inc. (F)

Charlie Brown's Second Super Book of Questions and Answers About the Earth & Space. Charles M. Schulz. Random House. 1977. 160p. gr. 3-5 ISBN: 0-394-83491-7 (P)

More Resources

Commander Toad & the Big Black Hole. Jane Yolen. Putnam Publishing. 1983. gr. 1-4 ISBN: 0-698-30741-0; 0-698-20594-4 (L)

Commander Toad and the Planet of the Grapes. Jane Yolen. (L)

Commander Toad in Space. Jane Yolen. (L)

Conquest of the Moon. Felix Sutton & Alvin Maurer. (F)

Curious George Gets a Medal. Hans Augusto Rey. (L)

A Day in Space. Suzanne Lord. Scholastic Inc. 1986. gr. k-3 ISBN: 0-590-40152-1 (L, F, S)

Easy to Make Spaceships That Really Fly. Mary Blocksma and Dewey Blocksma. Prentice-Hall. (F, L)

The Ewoks Join the Fight. Bonnie Bogart. (L)

Exciting Outer Space. Christopher Carrie. Binney and Smith. 1981. 48p. gr. k-4 ISBN: 0-86696-036-8 (L)

Explorers: A New True Book. Dennis Fradin. Childrens Press. 1984. 48p. gr.k-4

Fly Away with E.T. Kate Klimo. Simon & Shuster. 1983. 10p. ISBN: 0-671-46437-X (E)

Flying the Space Shuttle. Don Dwiggins. Dodd, Mead & Co. (F)

Footprints on the Moon. John Barbour. (F)

Freddie Freightliner Goes to Kennedy Space Center. David L. George. Childrens. 1983. 32p. gr. k-2 ISBN: 0-516-02497-3 (E, L, F)

Free To Be You and Me. F. Klagsbrun, ed. McGraw-Hill. 1974. (F)

From Actors to Astronauts. Daisy Jones and J. Louis Cooper. (F)

From Distant Galaxies. Marty Warner. (F)

Fun in Space. Creative Child Press. Playmore Inc. (F)

The Giant Book of Things in Space. George J. Zaffo. (L, F)

Gobo and the Prize from Outer Space. Lyn Calder. H. Holt & Co. 1986. 32p. gr. ps-2 ISBN: 0-03-007243-3 (E, L)

Gorp and the Space Pirates. David Ross. Walker & Co. 1983. 32p. gr. 1-3 ISBN: 0-8027-6494-0 (L)

Guide to Space-Craft. Robin Kerrod. Ray Rourke Publishing Co. Inc. 1981. (F)

Handling Your Disagreements. Joy Wilt. Word, Inc. 1980. (F)

Handling Your Ups and Downs. Joy Wilt. Word, Inc. 1979. (F)

Harold's Trip to the Sky. Crockett Johnson. Harper Junior Books. 1957. gr. k-3 ISBN: 0-06-022986-1 (L)

Heroes of the Challenger. Daniel and Susan Cohen. Pocketbook. 1986. (F)

High-Noon Rocket. Charles Paul May. (L)

How Space Rockets Began. LeGrand. (F)

Howard Had a Spaceship. Steve Lawhead. Lion USA. 1986. 32p. gr. 1-3 ISBN: 0-7459-1101-3 E)

Humans in Space. Lynn Beach. Young Astronaut Council. Marvel Books. 1987. 24p. ISBN: 0-87135-123-4 (P)

I Can Be an Astronaut. June Behrens. Childrens Press. gr. k-3 ISBN: 0-516-01837-X; 0-516-41837-8 (L, F)

More Resources

I Can Be an Astronomer. Paul Sepieri. Childrens Press. 1986. 29p. ISBN: 0-516-01883-3 (S)

I Want to Know About a Flight to the Moon. Alfred M. Worden. Doubleday. 1974. (N)

If You Were an Astronaut. Dinah Moche. Golden Books, Western Publishers. 1985. 24p. gr. ps-3 ISBN: 0-307-11896-7 (E, L, F, P, S)

Into Space. Michael W. Dempsey and Angela Sheehan. World. 1970. gr. primary (N)

Is There Life in Outer Space? Franklyn M. Branley. Harper Junior Books. 1986. 32p. gr. k-3 ISBN: 0-06-445049-X (L, S)

Jack the Bum and the UFO. Janet Schulman. (L)

Jed and the Space Bandits. Jean and Claudio Marzollo. Dial Books. 1987. 48p. gr. ps-3 LCCN: 84-015616 (E)

Jed's Junior Space Patrol. Jean and Claudio Marzollo. Dial Books. 1982. 56p. gr. ps-3 ISBN: 0-8037-24287-8; 0-8037-4288-6 (L)

Journey into a Black Hole. Franklyn M. Branley. Crowell Jr. Books. 1986. 32p. gr. ps-3 ISBN: 0-690-04543-3 (L)

Journey to the Moon. Erich Fuchs. Delacorte Press. 1970. 32p. gr. ps-3 I SBN: 0-440-042771-1; 0-440-04278-X (out of print) (E, N, F, L)

Junior's Day in Space: An Astronik Adventure. Melinda Luke. Random House. 1984. 32p. gr. 1-5 ISBN: 0-394-86393-3 (out of print) (E)

Kennedy Space Center: A New True Book. Timothy Gaffney. Childrens Press. 1985. 48p. ISBN: 0-516-01269-X (F, S)

Lanzaderas Espaciales. Margaret Friskey. Childrens Press. 1984. 48p. gr. k-4 ISBN: 0-516-31655-9 (L)

Let's Go on a Space Shuttle. Michael Chester. Putnam Sons. 1975. (F)

Let's Go on a Space Trip. Michael Chester. 1963. (F)

Let's Go To the Moon. Michael Chester. Putnam Sons. 1984. gr. primary-intermediate (N)

Let's Visit a Spaceship. Billy N. Pope and Ramona W. Emmons. Taylor Publisher. 1971. gr. primary-intermediate (N)

The Little Red Computer. Ralph Steadman. (L)

A Look Around Space. Margaret Holland and David Cooper. Willowisp Press. 1986. (F)

Marty McGee's Space Lab, No Girls Allowed. Martha Alexander. Dial Books Young. 1983. 32p. gr. ps-2 ISBN: 0-8037-00818-0 (L)

Medical Science and Space Travel. William Kinney. (F)

Merry Christmas, Space Case. James Marshall. Dial Books. 1986. 32p. gr. ps-3 ISBN: 0-8037-0215-9; 0-8037-0216-7 (E, L)

Monkey in the Rocket. Jean Bethell. Wonder. 1962. gr. k-3 ISBN: 0-448-05911-8 (out of print) (E, F)

Moon Flights: A New True Book. Dennis Fradin. Childrens Press. 1985. gr. k-4 ISBN: 0-516-01940-6 (L, S, F)

Moon Man. Tomi Ungerer. (L, F)

Mother Goose in the Space Age. Lillian Larson. Earthwise Publications. 1985. ISBN: 0-933494-28-9 (E)

My Brother Tries to Make Me Laugh. Andrew Glass. (L)

My First Book of Planets. Elizabeth Winthrop. (F)

More Resources

My First Book About Space. Dinah L. Moche. Western Publishing Golden Book. 1982. ISBN: 0-307-11870-3 (F, S)

My First Book of Space. Rosanna Hansen and Robert A. Bell. NASA. Simon & Schuster. 1985. ISBN: 0-671-60262-4; 0-671-60621-2 (N,S)

My Flight Bag. Kathleen Daly. Golden Press. 1967. (F)

My "S" Book. Jane Moncure. (F)

North, South, East and West. Franklyn M. Branley. Crowell. (F)

Now You Can Read About Spacecraft. Stephen Attmore. Willowisp Press, Inc. 1985. (F)

Outer Space. Eunice Holsaert. Holt, Rinehart and Winston. 1959. (F)

Outer Space Adventures. Alba Arboleda, Laura Cohen and Tina Harris. Educational Insights. 1986. (F)

People Could Fly. Virginia Hamilton. Knopf. 1985 (F)

Peter and the Rocket Tea. Hazel W. Carson. 1964. (F)

Pigs in Space. Ellen Weiss. (L)

Planets. Kim Jackson. Troll Associates. (F)

The Planets. Kate Petty. Franklin Watts. 1984. (F)

Planets and the Solar System. Troll Associates. (F)

Pirate Jupiter and the Moondogs. Nicole Rubel. Dial Books. 1985. 32p. gr. ps-3 ISBN: 0-8037-0145-4; 0-8037-0146-2 (E, L, S)

Professor Noah's Spaceship. Brian Wildsmith. Merrimack Publishers. 1985. 29p. gr. ps-3 ISBN: 0-19-272149-6 (L)

The Quasar Caper: An Astronik Adventure. Melinda Luke. Random. 1984. 32p. gr. 1-5 ISBN: 0-394-86392-5 (out of print) (E)

The Reluctant Little Astronaut. P. Mae Malone. Exposition Pr. FL. 1985. 32p. gr.3 (E)

Rockets and Astronauts. Brenda Thompson and Rosemary Giesen. Lerner Publications. 1977. gr. k-3 ISBN: 0-8225-1360-9 (L)

Rockets and Spaceflight. Osborne/Hayes. (F)

Romper Room Outer Space Activity Play Book. Playmore Publishing Co. (F)

Sally Ride, Astronaut An American First. June Behrens. Childrens Press. 1984. 32p. gr. 2-5 ISBN: 0-516-03606-8: 0-516-43606-6 (L)

Scienceland—Space Adventure (magazine) Vol. IX, No. 68, September, 1987. (F)

Skip Aboard a Space Ship. Jane Moncure. Childs World. 1978. gr. ps-3 ISBN: 0-89565-009-6; 0-89565-042-8 (L, F)

Skylab: A New True Book. Dennis Fradin. Childrens Press. 1984. 48p. gr. k-4 I SBN: 0-516-01727-6; 0-516-41727-4 (L, S, F)

Sometimes I Get So Mad. Paula Hogan. Raintree Childrens Books. (F)

Space (Read About Science). J. Seevers. Raintree. 1978. gr. k-3

Space: A New True Book. Illa Podendorf. Childrens Press. 1982. 4 p. (L, F)

Space Camp. Patrick Bailey and Walter Coblena. Scholastics. 1968. (F)

Space Case. Edward Marshall. Dial Books. 1982. 40p. gr. k-3 ISBN: 0-8037-8431 (L)

Space Cats. Steven Kroll. Avon. 1981. 48p. gr. 1-4 ISBN: 0-380-53371-5; 53371-5 (L)

More Resources

Space Colonies: A New True Book. Dennis Fradin. Children Press. 1985. 48p. (P)

Space Colony. Joe Burleson. Putnam Pub. Group. 1984. 9p. ISBN: 0-399-21058-X (out of print) (P)

Space Craft. Michael Jay. Watts. 1983. gr. 2-4 (F)

Space Exploration Photo Postcards in Full Color. NASA Archives. Charles Hacker and Jean Hacker, eds. Dover Publications. 1986. ISBN: 0-486-25212-4 (P)

Space Exploration & Travel. Louis Sabin. Troll Associates. 1985. ISBN: 0-8167-0258-6; 0-8167-0259-4 (S)

Space Flight. Stewart Cowley. (F)

Space Frontiers. Couper Heather. "How Space Shuttle Goes Up." (F)

Space Hijack! Nancy Robinson. Lothrop. 1979. gr.1-4 ISBN: 0-688-41897-X; 0-688-51897-4 (out of print) (E)

Space Mission. (a pop-up book) Terry Pastor. Little Brown. 1982. ISBN:0-316-69333-2 (S)

Space Monster. David Ross. (L)

The Space Monster. Holly Stephenson. (F)

Space Ship. James L. Mursell. (F)

Space Monster Gorp and the Runaway Computer. David Ross. (L)

Space Shuttle. David Baker. Crown. 1979. gr. 7-9 (F)

Space Shuttle (Picture Library). N. S. Barrett. Franklin Watts, Ltd. 1985 (F)

Space Shuttle. Michael Jay. Franklin Watts Inc. 1984. (F)

Space Shuttle. Robin Kerrod. W. H. Smith Publishers. 1985. ISBN: 0-8317-7963-2 (F, S)

Space Shuttle. Kate Petty. Franklin Watts First Library. (F)

The Space Shuttle Action Book. (a pop-up book) Patrick Moore. Random House. 1983. 12p. gr. 3-7 (P)

Space Shuttle-The Inside Story. Nigel Hawkes. Gloucester Press. 1983. (F)

Space Shuttles: A New True Book. Margaret Friskey. Childrens Press. 1982. 48p. gr. k-4 ISBN: 0-516-41655-3 (F, S)

A Space Story. Karla Kuskin. (L)

Space Travel Starters Facts. John Cameron (illus). (F)

Space Travel. Ortleb and Cadice. (F)

Space Walker. Robin Kerrod. (F)

Space Witch. Don Freeman. Viking Press. 1959. (F, L)

Spacecraft. Norman Barrett. Watts. 1986. 32p. gr. k-6 ISBN: 0-531-10006-5 (L)

Spacelab: A New True Book. Dennis Fradin. Childrens Press. 1985. 48p. gr. k-4 ISBN: 0-516-41930-7 (L, S)

Squaps the Moonling. Ursina Ziegler. (L)

Star Wars Question and Answer Book About Space. Dinah Moche. Random House. 1979. (F)

SuperTed and the Stolen Rocket Ship. Mike Young. Random. 1984. 24p. gr. 1-5 ISBN:0-394-87154-5 (E)

SuperTed on the Planet Spot. Mike Young. Random. 1984. 24p. gr. 1-5 ISBN: 0-394-87153-7 (E, L)

More Resources

This is Cape Kennedy. M. Sasek. Fratelli Frabbri, Inc. 1963. (F)

A Trip in Space. Bruce Grant. (F)

A Trip Through Space. Childcraft, Vol. 4. Field Enterprises Educational Corporation. 1976. (F)

Trouble in Space. Rose Greydanus. Troll Associates. 1981 32p. gr. k-2 ISBN: 0-89375-517-6 (L, S)

Two Centuries of Progress. H. Eibling, C. Jackson and Vito Perrone. (F)

2-B and the Space Visitor. Sherry Paul. (L)

Up , Up & Away. Margaret Hillert. Modern Curriculum Press. 1981. 32p. gr. 1-6 ISBN: 0-695-31541-2 (L)

The Voyager Space Probes: A New True Book. Dennis Fradin. Childrens Press. 1985. 48p. gr. k-4 ISBN: 0-516-01944-9 (S)

Westab's Space Age World Atlas. "The Earth, Mountains, Deserts and Valley as Seen by the Astronauts." Jeppesen and Company. 1956-1962 (F)

What About-Space Shuttle? Ron Cave and Joyce Cave. Watts. 1982. 32p. gr. k-3 ISBN: 0-531-03465-8 (L, F)

What Does and Astronaut Do? Wells. (F)

What If...I Were An Astronaut? Graham Round. Barron's Educational Series Inc. 1987. (F)

What Next, Baby Bear! Jill Murphy. (L)

World and Space. Field Enterprises Educational Corporation (F)

The World in Space. Alexander Marshack. (F)

The Wump World. Bill Peet. (L)

You Will Go to the Moon. Mae Freeman. (L)

UNCLASSIFIED

ABC's of Space. Issac Asimov. Walker. 1969. gr. primary (N, F)

All About Energy. Richard Dalton. Third Press. 1975. gr. primary-intermediate-upper (N, F)

Alphobots. Jonathon Gathrid. Slawson Communications. 1985. ISBN: 0-915391-01-5 (S)

Astronomy Encyclopedia. Rand McNally and Co. 1984. (F)

Atomic Energy. Jerry Robinson. (F)

Computers: A New True Book. Karen Jacobsen. Children Press. 1982. 48p. (P)

Exploring Science. George G. Mallinson and Ester P.Ellwood. (F)

Get Ready for Robots! Patricia Lauber. Thomas Y. Crowell. 1987. Ages 4-8 ISBN: 0-690- 04576-X S)

Get Ready, Set, Grow! Eileen Morris and Stephanie Perean Crilly. (F)

The How and Why Wonder Book. Norman Hoss. (F)

The Know How Book of Experiments. Heather Amery. Usborn Publishing Co. 1979. (F)

National Geographic: (F)
December, 1969. (Vol. 136, No.6)
February, 1982.
September, 1983.
January, 1985. "The Planets Between Fire & Ice." (Vols. 138, 154, 160, 163, 167)
August, 1985. (Vol. 168, No. 2)
Oct. 1986. "Soviets in Space, Are They Ahead?" (Vol. 170., No. 4)

Our Friend the Atom. Hienze Haber. (F)

More Resources

Poetry for Space Enthusiasts. Leland B. Jacobs, ed. Garrad. 1971. gr. primary-intermediate (N)

UFO Kidnap. Nancy Robison. (L)

Science for the Early Childhood Years. Third Edition. Jean D. Harlan. (F)

Where. William Pattison. F)

YOUNG ASTRONAUT COUNCIL APPROVED BOOK LIST

Astrology and Planetology. Necia H. Apfel. Watts. 1983. gr. 6-9

The Astronauts. Dinah Moche. Random House. 1979.

The Challenge of Space. Robin Kerrod. Lerner Publications Co. 1980. gr. 4-7

Drawing Spaceships and Other Spacecraft. Don Bolognese. Watts. 1982. gr. 6-9

Giant Planets. Alan Nourse. Watts. 1982. gr. 6-9

Living in Space. James S. Trefil. Scribner. 1981. gr. 7-9

Look to the Night Sky. Seymour Simon. Viking. 1977. gr. 6-9

Mission Outer Space. Robin Kerrod. Lerner Publications. 1980. gr. 4-7

The Mystery of the Comets. Fred L. Whipple. Smithsonian. 1985. gr. 7-9

The New Astronomy, Probing the Secrets of Space. Fred D'Ignazio. Watts. 1982. gr. 5-9

The Night Sky. Martyn Hamer. Watts. 1983. gr. 2-4

Out to Launch: Model Rockets. Ross Olney. Lothrop. 1979. gr. 4-9

The Planets in Our Solar System. Franklyn M. Branley. Crowell. 1981. gr. k-2

Race for the Moon. Robin Kerrod. Lerner Publications Co. 1980. gr. 4-7

The Rocket Book. Robert Cannon and Michael Banks. Prentice-Hall. 1985. (Teacher)

Sally Ride and the New Astronauts. Karen O'Connor. Watts. 1983. gr. 6-9

Scholastic "The Planets: Exploring the Solar System." Roy Gallant. 1982. gr. 7-9

Space (Read About Science). J. Seevers. Raintree. 1978. gr. k-3

Space Challenger: The Story of Guion Bluford. S. J. Haskins and Benson. Carolrhoda. 1984. gr. 1-4

Spacecraft. Michael Jay. Watts. 1983. gr. 2-4

Spacelab, Research in Earth Orbit. David Shaplant and Michael Rycroft. Cambridge. 1984. gr. 7-9

Space Science. Christopher Lampton. Watts. 1982. gr. 4-7

Space Shuttle. David Baker. Crown. 1979. gr. 7-9

Space Shuttle. L. B. Taylor, Jr. Harper-Row. 1979. gr. 6-9

Space Shuttle Commander. Paul Westman and John Young. Dillon. 1981. gr. 3-4

The Space Shuttle Operator's Manual. Kerry Mark Joels, Gregory Kennedy and David Larkin. Ballantine. 1982. gr. 5-9

Space Shuttle, A Quantum Leap. George Torres. Presidio Press. 1986. gr. 7-9

Space Telescope. Franklyn M. Branley. Crowell. 1985. gr. 4-6

More Resources

Space Travel. Jeanne Benedick. Watts. 1982. gr. 4-8

Star Travel (World of the Future Series). Gatland and Jeffries. EDC. 1979. gr. 5-9

The Young Scientist Book of Spaceflight. K. Gatland. EMC. 1978. gr. 4-5

MAGAZINES

The following periodicals feature frequent articles on space, science and technology.

AVIATION SPACE
AVIATION WEEK & SPACE TECHNOLOGY
DISCOVER
NATIONAL GEOGRAPHIC
NATIONAL GEOGRAPHIC WORLD
OMNI
SCIENCE '85/'86
SMITHSONIAN
SPACE WORLD

RESOURCE BOOKS FOR TEACHERS

Mars One Crew Manual. Kerry Mark Joels. Ballantine Books. 1985.

The Museum of Science and Industry Basic List of Children's Science Books. Berniece ritcher and Duane Wenzel (compilers). American Library Association. Chicago. 1986. (includes 460 book reviews.)

Parachute Play. Dick & Liz Wilmes. Building Blocks Press.

Space Shuttle. Robin Kerrod. Gallery Books. W. H. Smith Publishers, Inc. 70p. ISBN: 0-8317-7963-2

Space Shuttle Food Systems. National Aeronautics & Space Administration. Publication number NF-150/1-86

The Space Shuttle Operator's Manual. Kerry Mark Joels, Gregory Kennedy and David Larkin. Ballantine. 1982. gr. 5-9

(NASA Photo)

NASA Teacher Resource Centers

NASA Resources

Teacher Resource Centers are established to provide educators with NASA-related, educational materials for use in the classroom. These materials can be used as references or duplicated at the Center. They include classroom activities, lesson plans, teacher guides, laser discs, slides, audio and video tapes.

Please contact the NASA Center that serves your state for further Teacher Resource Center material or information about other available services.

NASA Ames Research Center Teacher Resource Center Mail Stop 204-7 Idaho, Montana, Moffet Field, CA 94035 (415) 694-6077	Alaska, Arizona, California, Hawaii, Idaho, Montana, Nevada Oregon, Utah, Washington, Wyoming
NASA Goddard Space Flight Center Teacher Resource Center Mail Code 130.3 Greenbelt, MD 20771 (301) 286-8570	Connecticut, Delaware, District of Columbia, Maine, Maryland, Massachusetts, N. Hampshire, N. Jersey, N. York, Pennsylvania, Rhode Island, Vermont
Jet Propulsion Laboratory Science and Mathematics Teachign Resource Center c/o Educaton Outreach-SMTRC Mail Stop 520 Pasadena, CA 91109 (818) 345-6916	Alaska,Arizona, California, Hawaii, Idaho, Montana, Nevada, Oregon, Utah, Wahington, Wyoming

NASA Teacher Resource Centers

NASA Lyndon B. Johnson Space Center Teacher Resource Center Code AP-4 Houston, TX 77058 (713) 483-3455/4433	Colorado, Kansas, Nebraska, New Mexico, North Dakota, Oklahoma, South Dakota, Texas
NASA John F. Kennedy Space Center Educator Resource Lab Mail Code ERL KSC, FL 32899 (305) 867-4090/9383	Florida, Georgia, Puerto Rico, Virgin Islands
NASA Langley Research Center Teacher Resource Center Mail Stop 146 Hampton, VA 23665 (804) 865-4468/3017	Kentucky, South Carolina, Virginia, West Virginia North Carolina,
NASA Lewis Research Center Teacher Resource Center Mail Stop 8-1 Cleveland, OH 44135 (216) 433-2017	Illinois, Indiana, Michigan, Minnesota, Ohio, Wisconsin
NASA George C. Marshall Space Flight Center Teacher Resource Center Huntsville, AL 35807 (205) 837-3400	Alabama, Arkansas, Iowa, Louisiana, Mississippi, Missouri, Tennessee
NASA National Space Technology Laboratories Teacher Resource Center Building 1200 NSTL Station, MS 39529 (601) 688-3338	(no assigned area)

Florida Head Start List

Polk County Opportunity Council, Inc.
Bartow, FL

Manatee County Head Start
Bradenton, FL

Head Start of Brevard County
Cocoa, FL

Volusia County Head Start
Daytona Beach, FL

Lee County Head Start
Fort Meyers, FL

Okaloosa County Comprehensive Child Development Program, Inc.
Ft. Walton Beach, FL

Child Development Services / Head Start / NFCAA
Jacksonville, FL

Tri-County Community Council, Inc. Head Start
Bonifay, FL

Hernando/Sumter Head Start
Brooksville, Fl

Pasco County Head Start Program
Dade City, FL

Lake County Head Start
Eustis, FL

St. Lucie County Head Start Program
Fort Pierce, FL

School Board of Alachua County Head Start
Gainesville, FL

Pinellas County Head Start
Largo, FL

Head Start Programs
Pilot Project

Head Start Programs Pilot Project

Marion County Head Start
Ocala, FL

Putnam-Clay Head Start
Palatka, FL

Escambia County CAP Head Start
Pensacola, FL

Dade County Community Action Agency Head Start
Miami, FL

Orange County Head Start / Dept. of Community Affairs
Orlando, FL

Taylor County Improvement Club, Inc.
Perry, FL

Gadsden County Head Start
Quincy, FL

Hillsborough County Head Start Program
Tampa, FL

Sarasota County Head Start Program
Sarasota, FL

School Board of Hillsborough County Head Start Program
Tampa, FL

Palm Beach County Head Start
West Palm Beach, FL

Oklahoma Head Start List

Cherokee Nation Head Start
Tahlequah, OK

Head Start Programs Submitted Ideas

Great Ideas

The Young Astonaut Council and the Administration For Children, Youth and Families express their appreciation to the following Head Start staff and their programs for submitting mathematics, science and space-related curriculum ideas and activities to be included within this first preschool, aerospace, enrichment curriculum, *Living in Space*. We especially appreciate Florida Head Start pilot programs whose suggestions helped evolve draft ideas into this final form.

The Council and ACYF are overwhelmed by the number of responses from the Head Start community. We salute these preschool pioneers.

We encourage programs using the enrichment module to network with others and develop aerospace curriculum-user groups to expand upon this initial curriculum.

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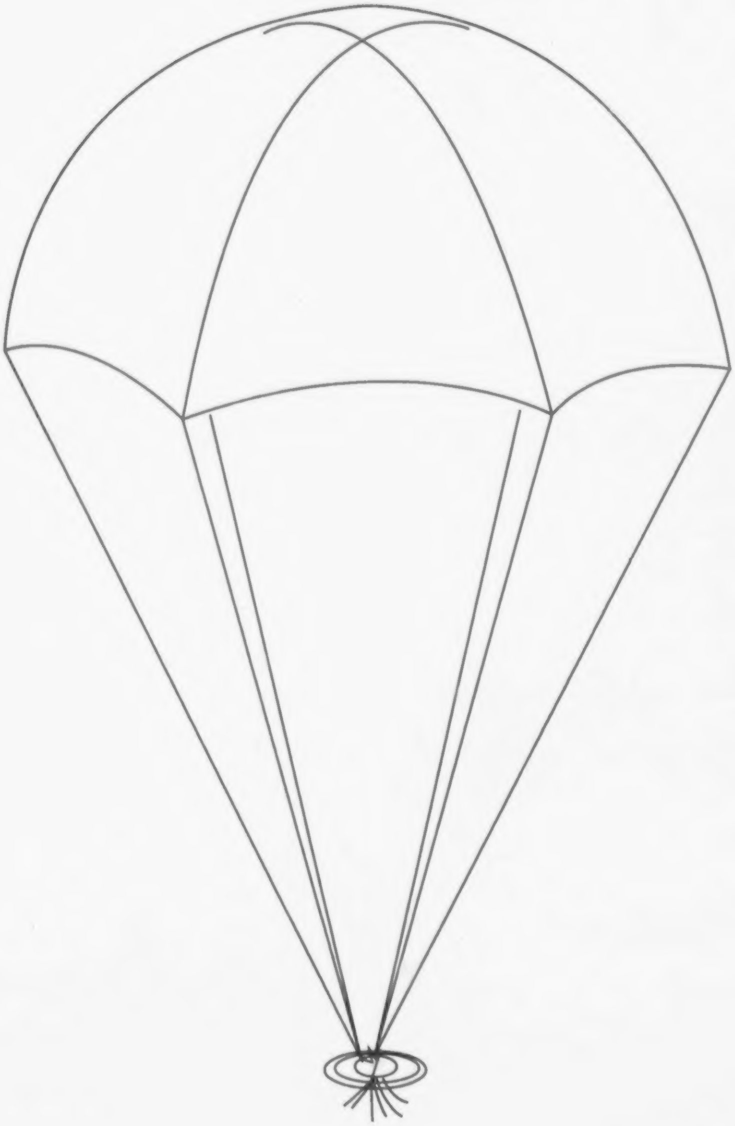
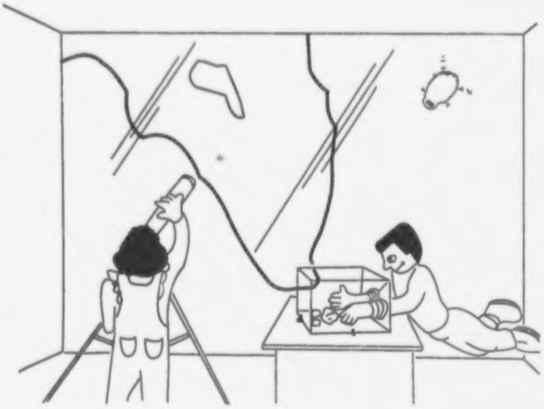


(YAC Illustrations)

Photographs



(YAC Illustration)

NASA Photographs

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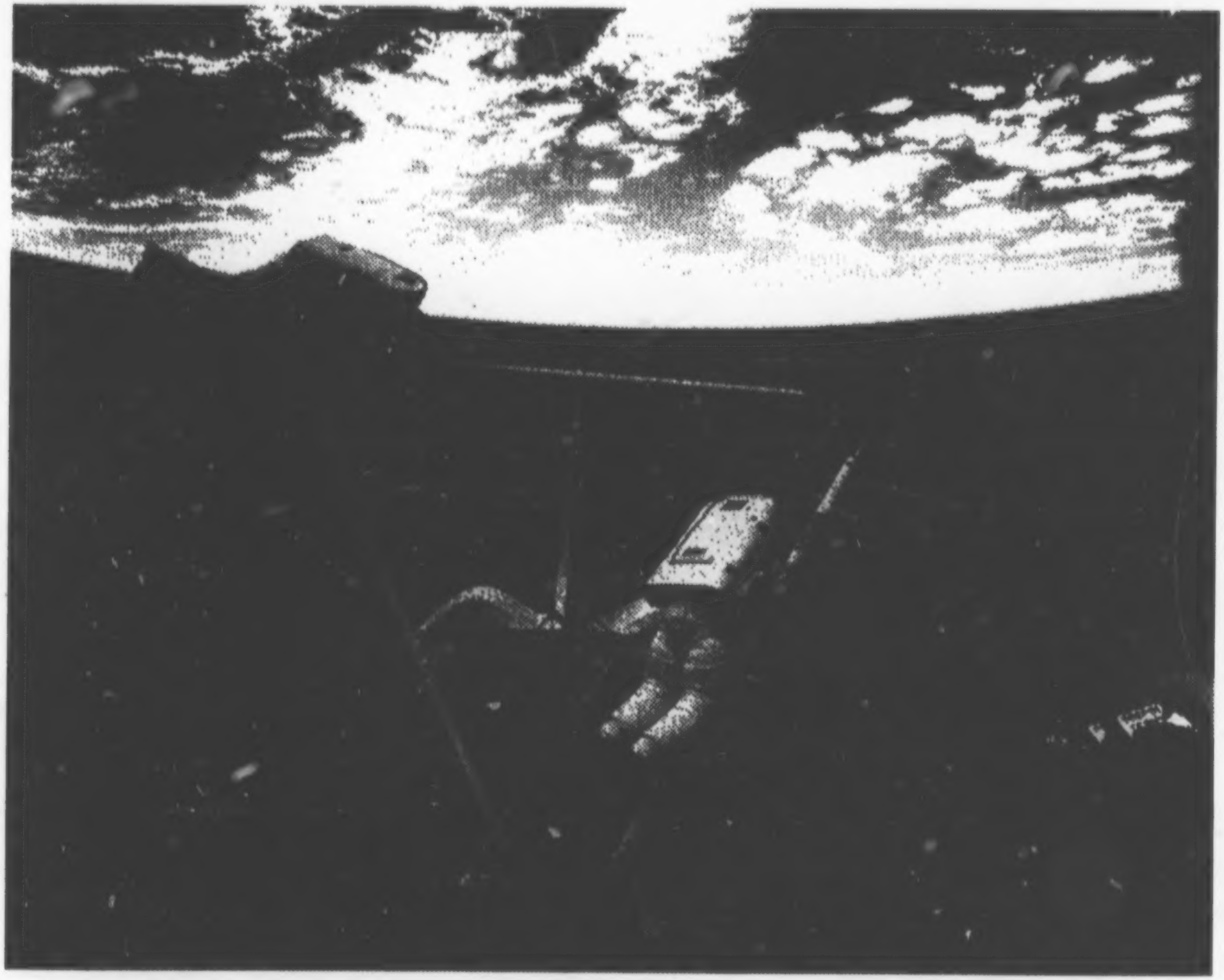

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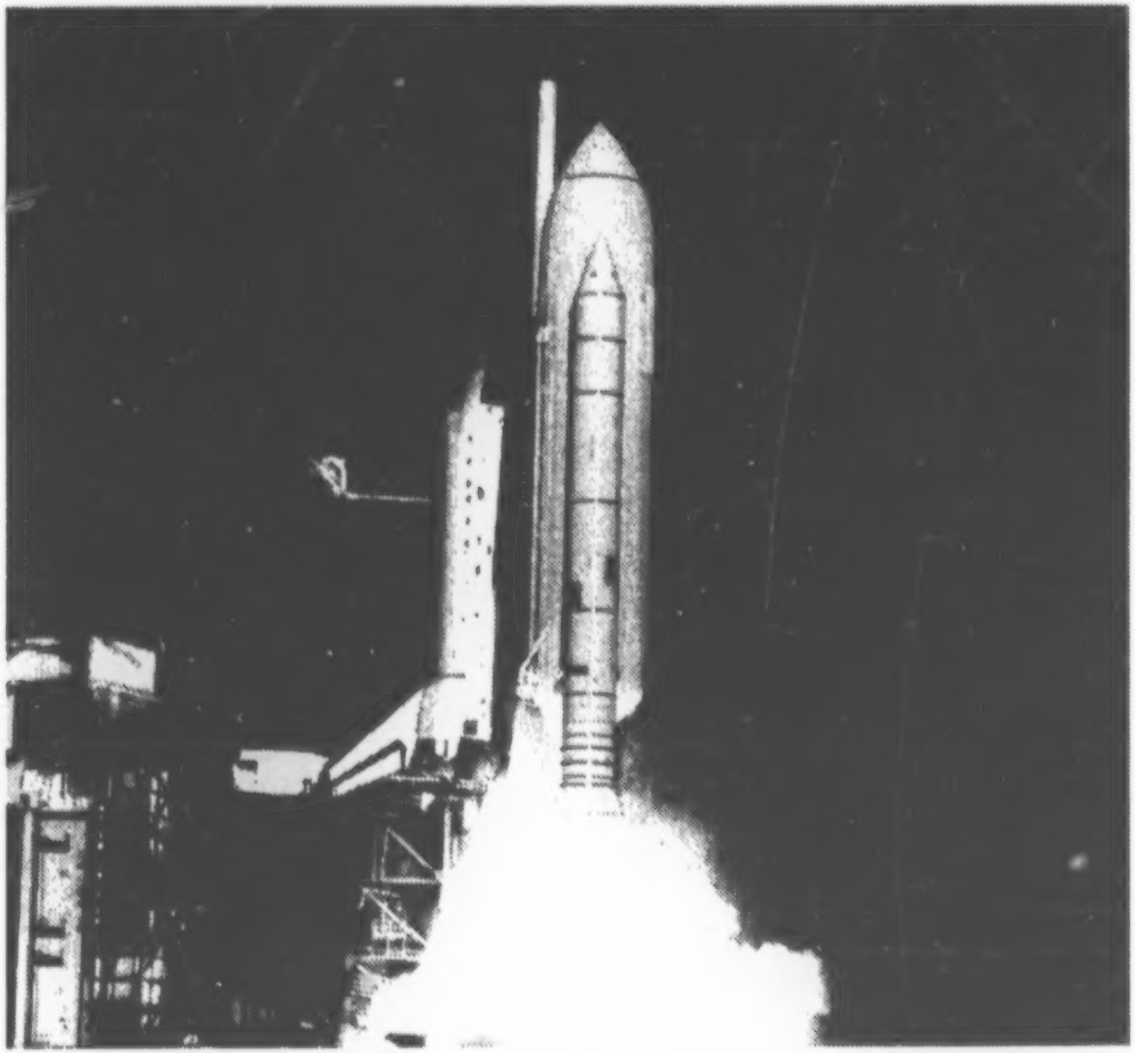

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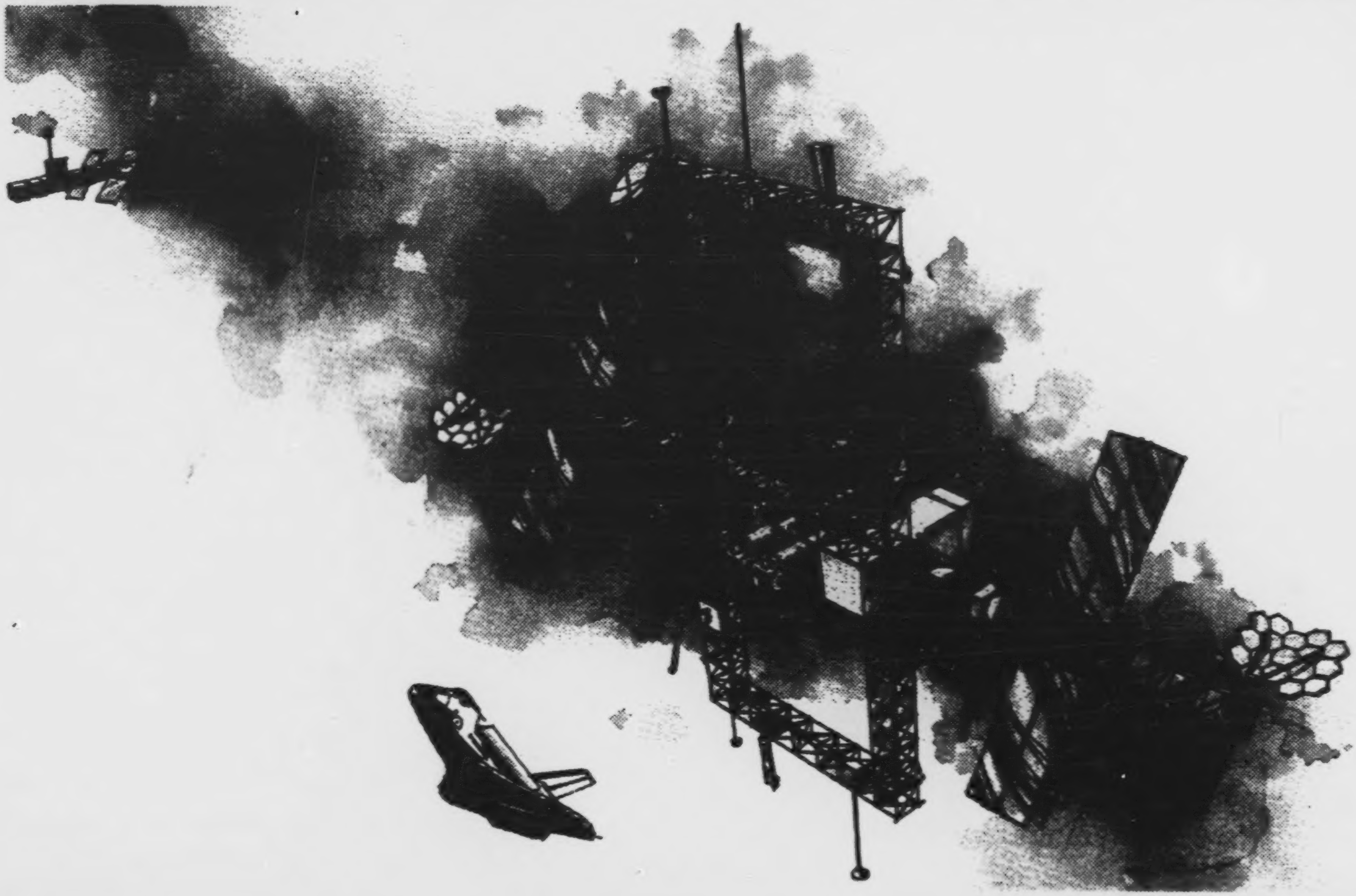

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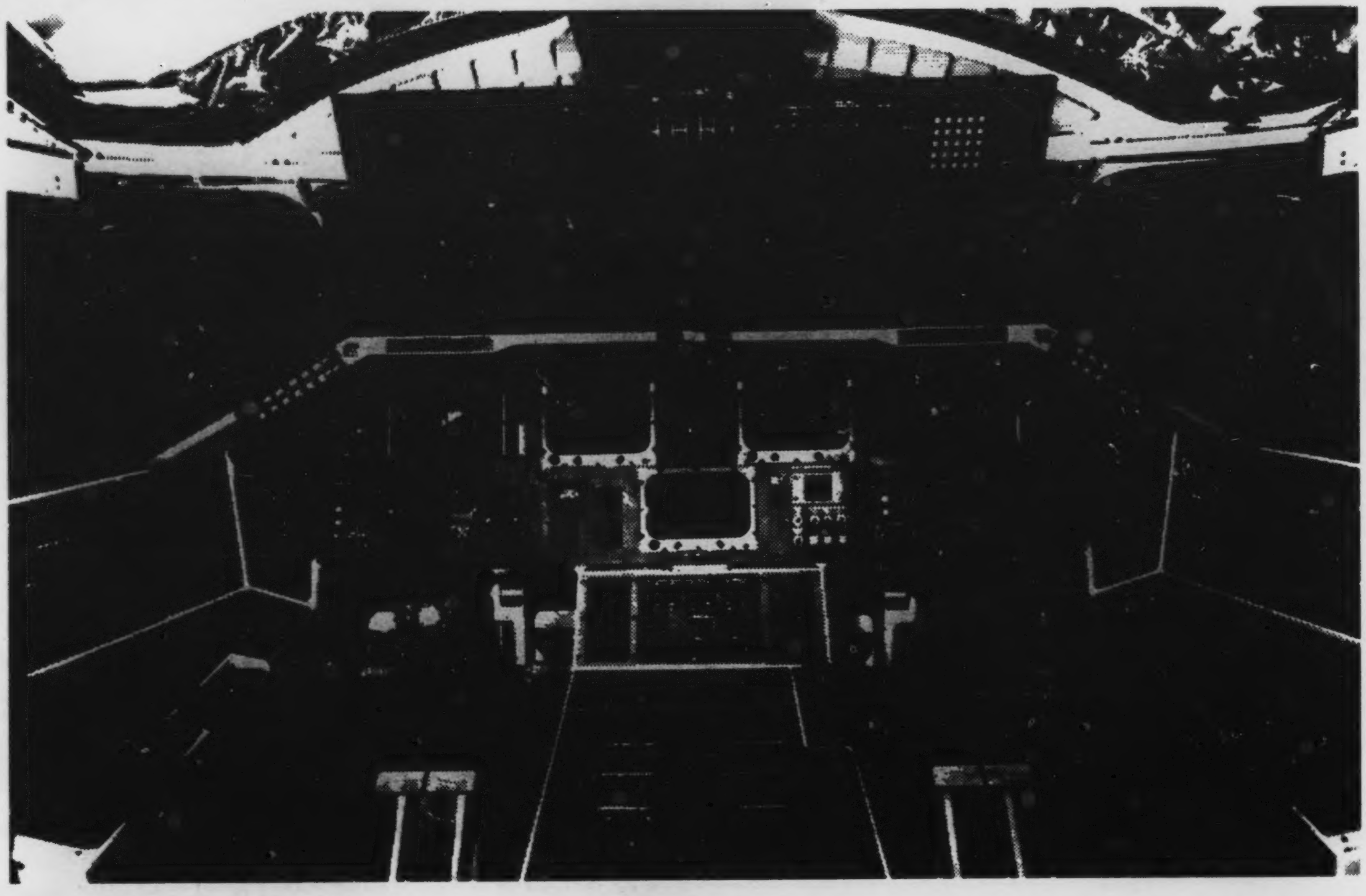

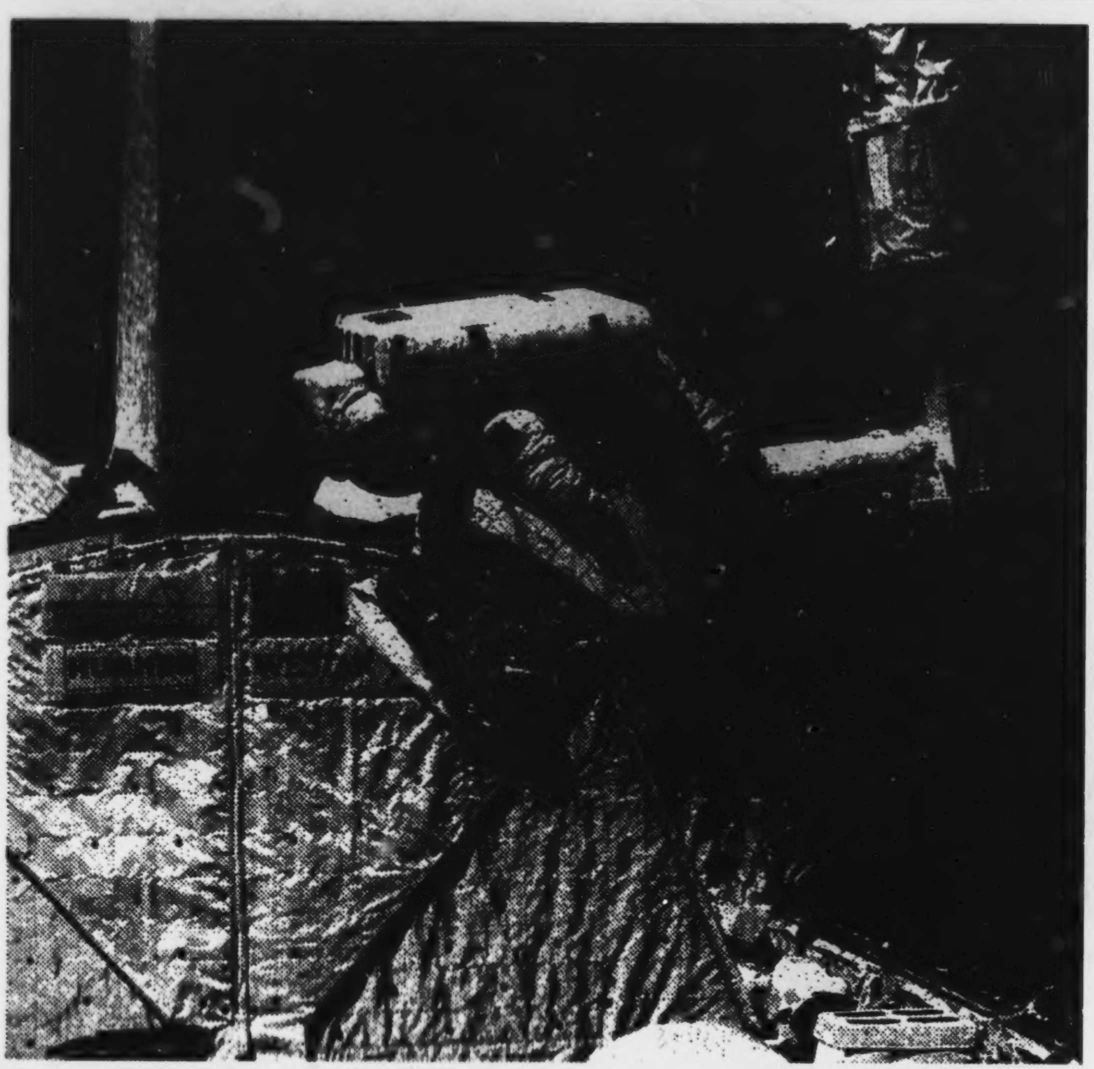

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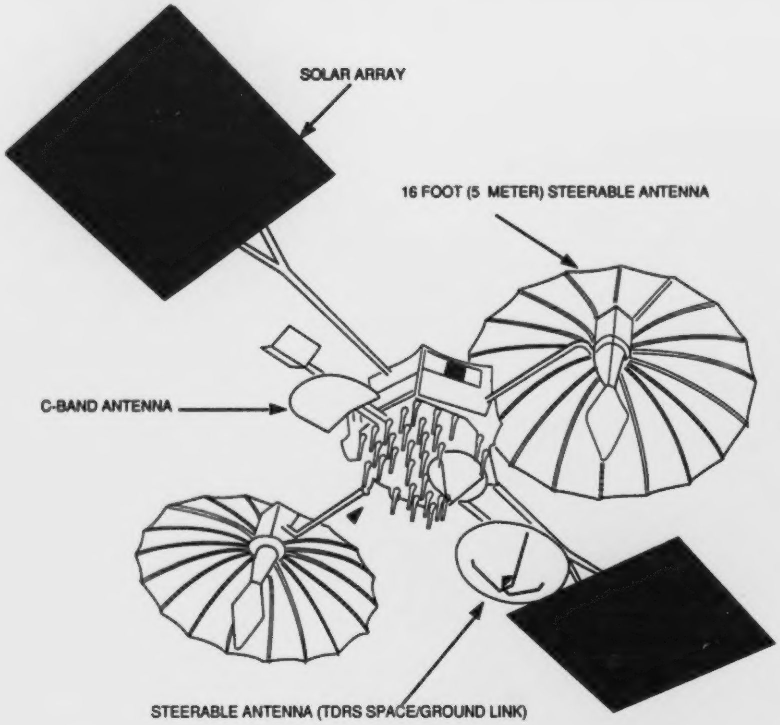
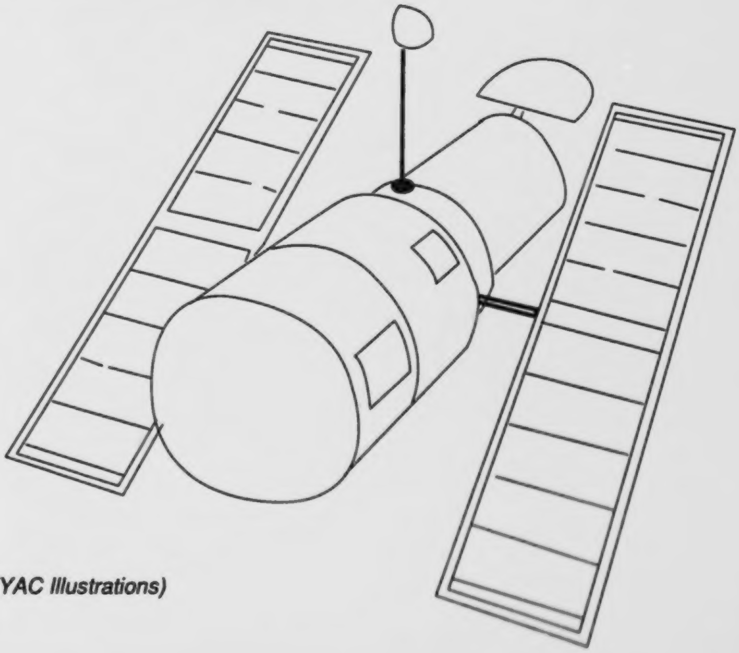
More Illustrations


SOLAR ARRAY
16 FOOT (5 METER) STEERABLE ANTENNA
C-BAND ANTENNA
STEERABLE ANTENNA (TDRS SPACE/GROUND LINK)



(YAC Illustrations)

The "Why?"

Children need to get excited about math and science. The future holds many challenges, and opportunities, for those who have the necessary skills and education. Those who do not possess a solid foundation of these subjects will be left behind. The United States, as a whole, will be left out as a leader in innovation [and the world economy] if more students cannot grasp more than just a skeleton of basic math and science concepts.

Space provides an ideal theme in which to foster a thirst for knowledge. People, almost since time began, have been fascinated with the Earth, the sky, the planets and the stars. By learning about space today, children will gain some of the necessary tools to live in the space-age of tomorrow while participating in something exciting.

Curricula for young children that has a hands on approach offers children a chance to learn with their senses. Young children learn more expediently through this method than with other educational techniques. This curriculum is one such example.

We can stimulate a young child's natural curiosity with activities that inspire them to express their thoughts and ideas through words and pictures. By encouraging them to think conceptually, we are guiding them to the keys to unlock future innovation: creativity and imagination.

The "How"

The Information Technologies Group (ITG) took the material compiled by the Panel of Experts and transformed it into a high quality product that was easy to follow and appealing to the eye.

The group set a record in producing a document of this size: eleven weeks form the time the ITG people first saw the material to the day the book was sent to the publisher. A number of surprises were encountered by the group along the way.

The complexity and difficulty of the project was not completely foreseen. Formats had to be developed and approved by a variety of people. Sections were deleted only to be added again later. Changes were constantly made in the order of sections. Continuity had to be maintained. Photos needed to be selected, organized and ordered for each section. It was a long road.

To complete this as a desktop publishing project and to pave the way for varied distribution, including traditional printed copies, electronic printing and a software version, the group brought together the finest personal computers, laser printers, scanners and software programs available. Individuals were then taught to use these tools effectively and allowed to complete their portion of the project in their own manner. The result: a first-class curriculum guide and what we believe are **the best** preschool material available anywhere.

Notes

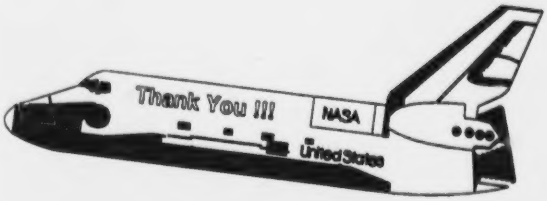
If the Young Astronaut Council (YAC) is to make today's children more competent in math, science and other technology-related fields—and, that is the goal —YAC must be a leader in using new technologies to explore new frontiers in the educational field. We realize and accept this.

...There exists today a knowledge gap that we all must fight ...and we are very proud of our first effort in the fight...

Charles L Largay

Kenneth C Visser Theresa Ferraro

Credits



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A future Mars explorer gets a hug from his astronaut dad.

YOUNG
ASTRONAUTS
UNITED STATES of AMERICA

Living In Space!!!
A Preschool Aerospace Curriculum Module

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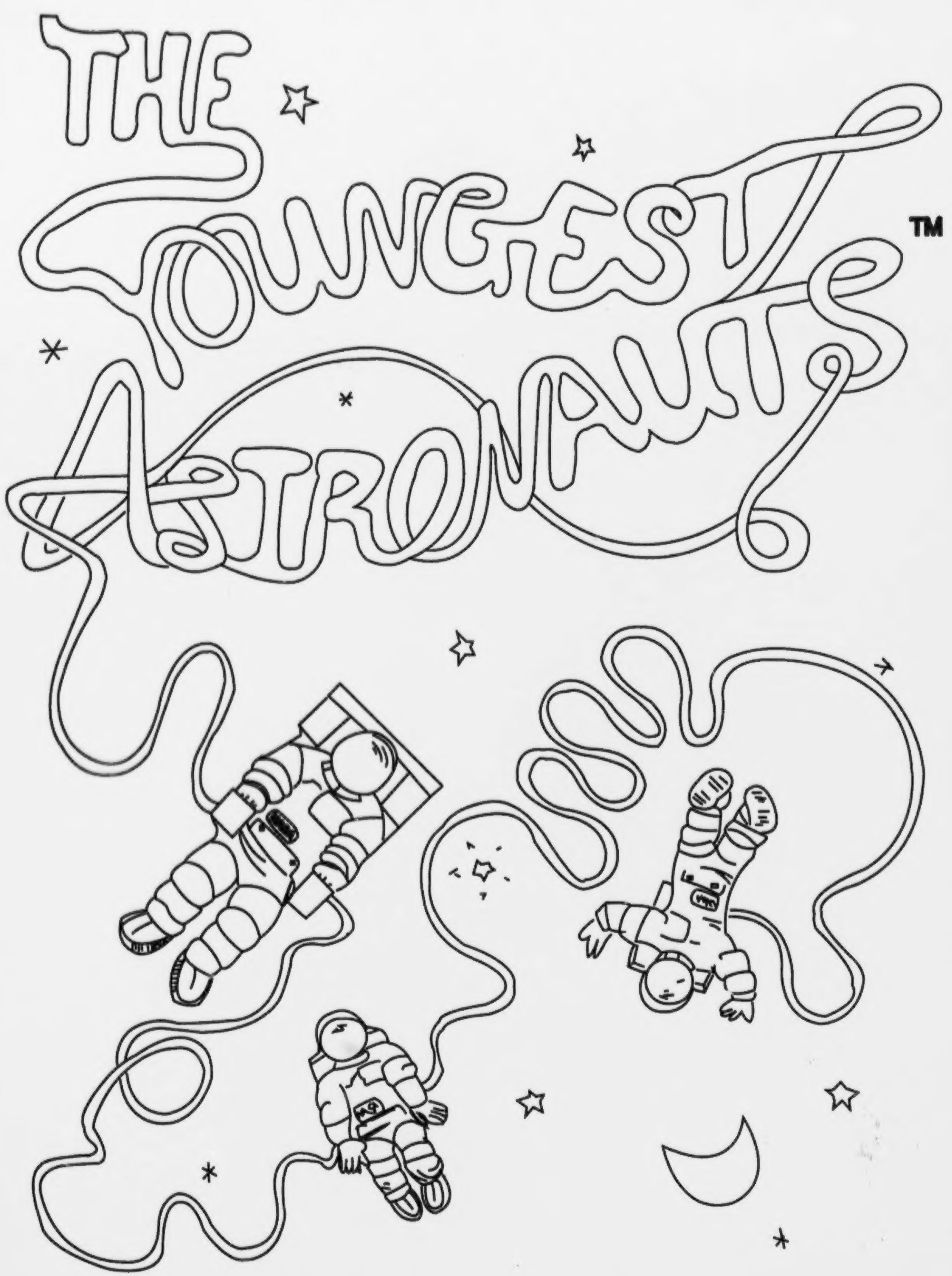
THE YOUNGEST ASTRONAUTS™

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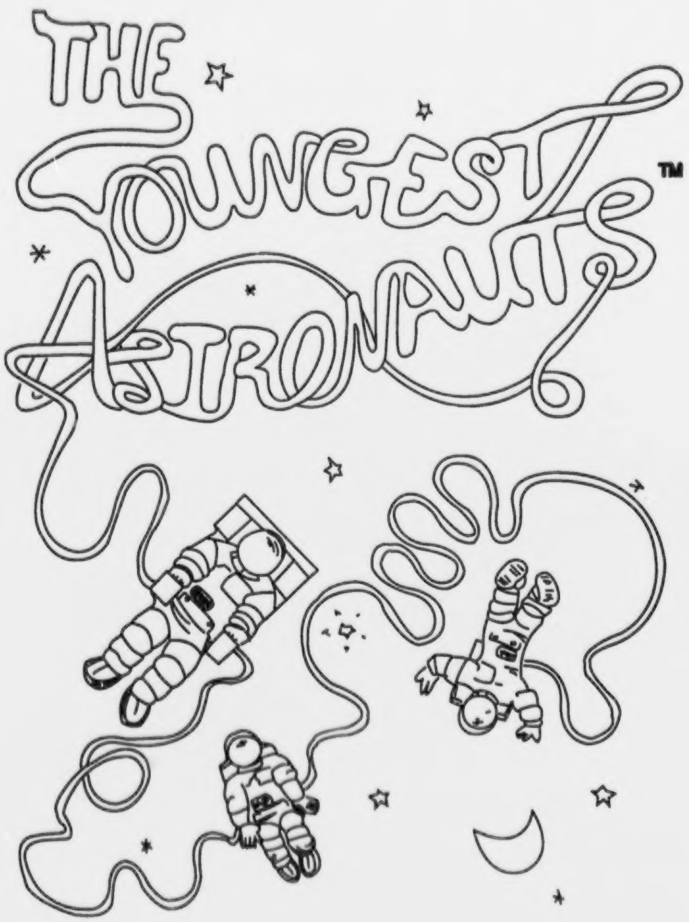

The Youngest Astronauts™

by Kerry Mark Joels, Mary Lewis and Jim Matlack.

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Based on original art design and illustrations by Eddie Sutton, Cindy Phillip and Deana Marie of Animation House Inc.

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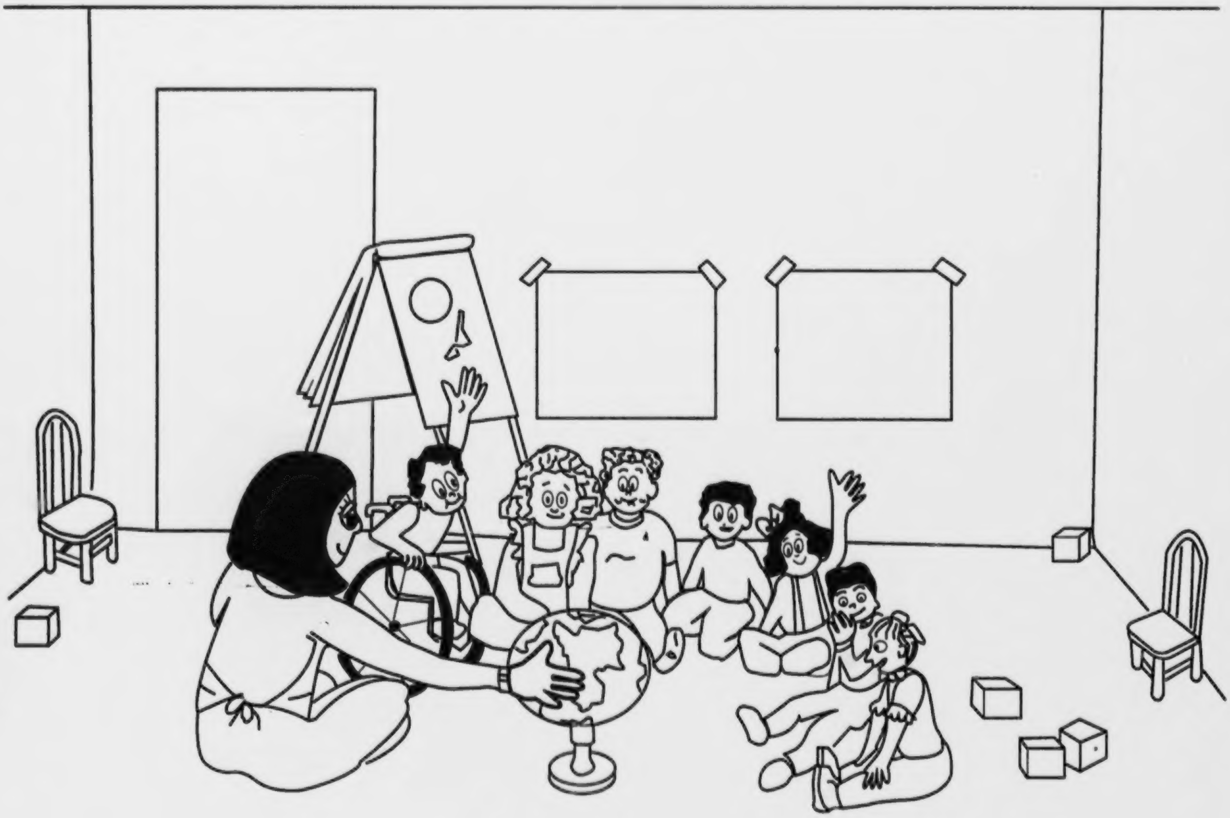
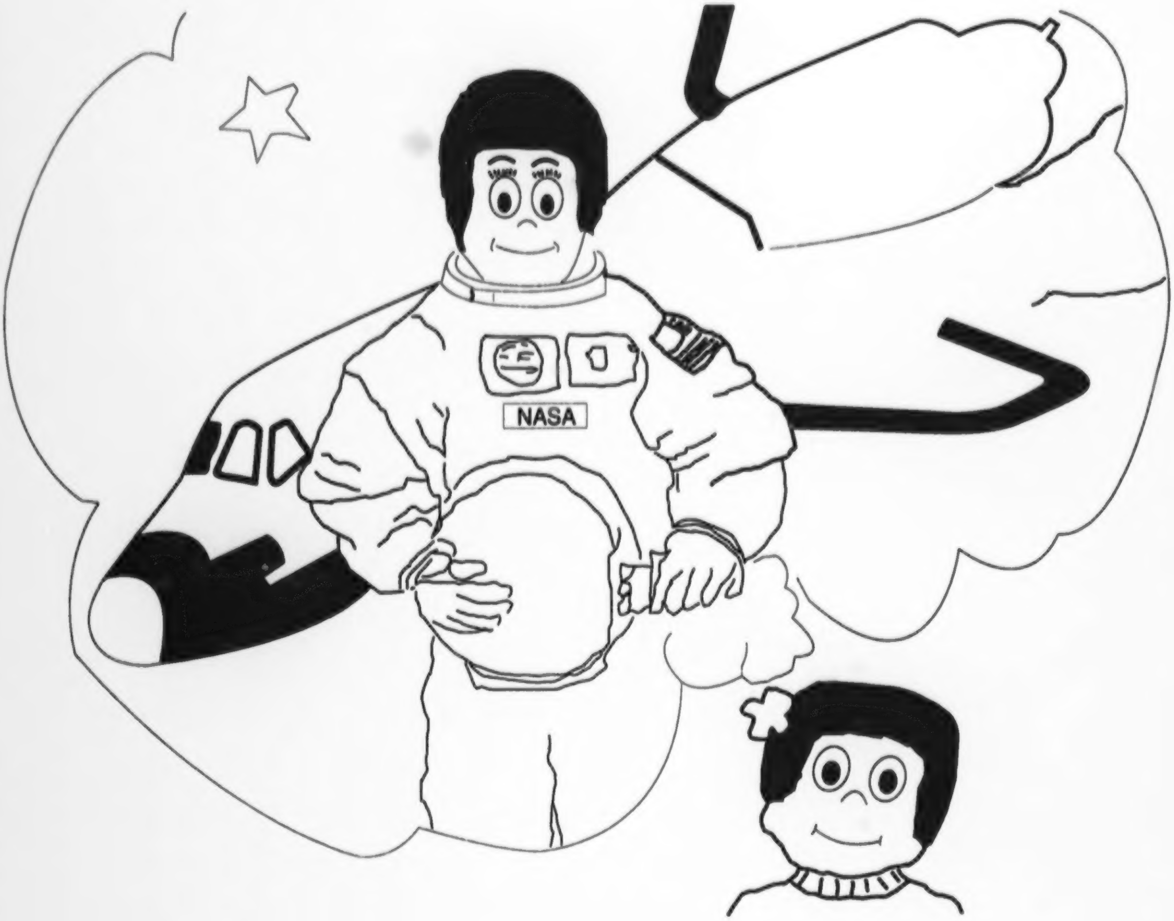
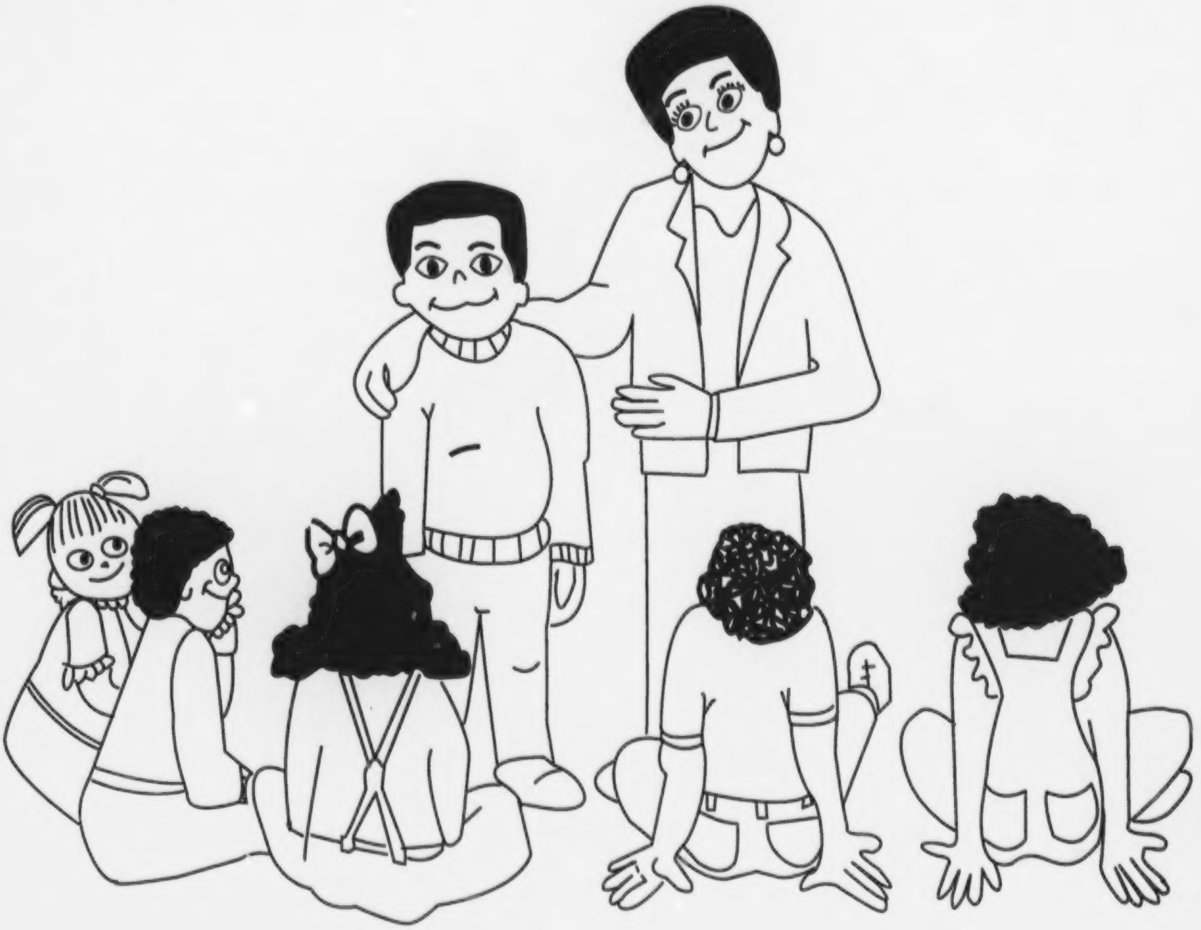


The children in Mario's school are learning about space travel. Today, they are very excited. A visitor is coming to tell them about a trip into outer space. Mario is the most excited. The visitor is his mother!

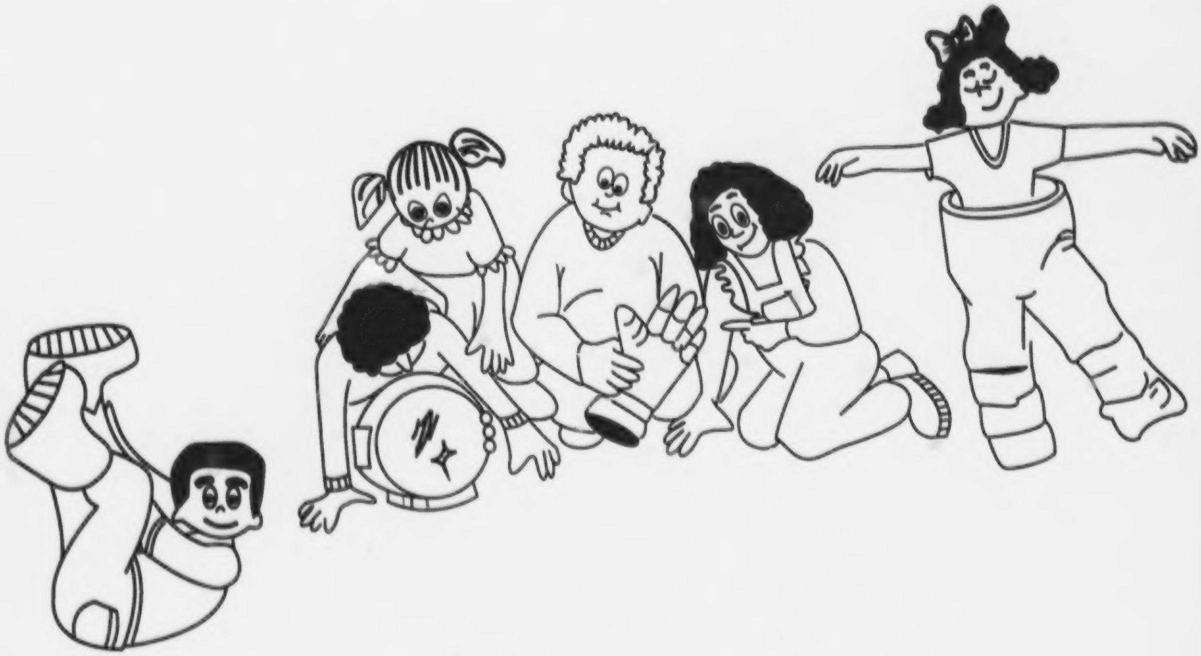


Mario's mother is a scientist who studies weather. Soon she will become an astronaut and fly in a space shuttle to a space station that is circling Earth.

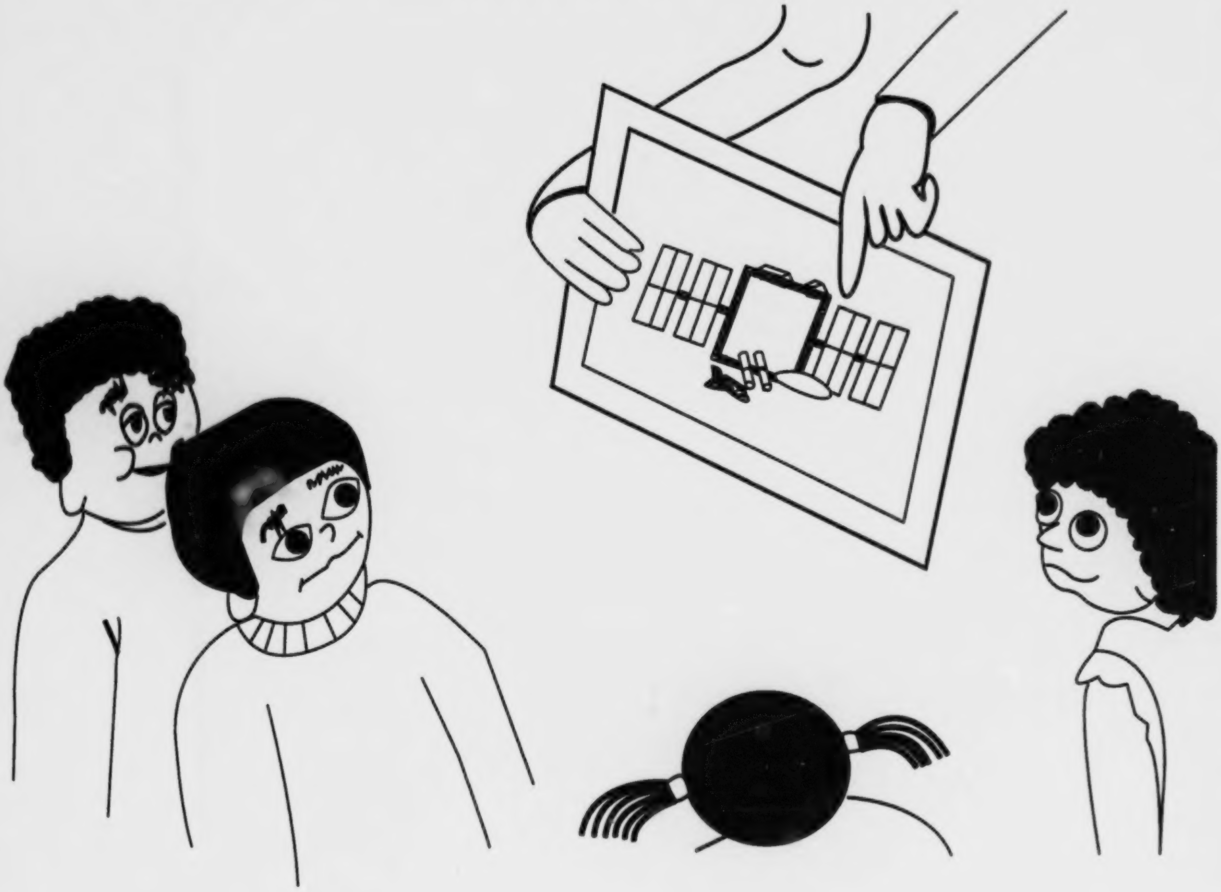
Mario's mother is called a mission specialist. From the space station, high above our planet, she will study the clouds, winds and storms that make our weather.



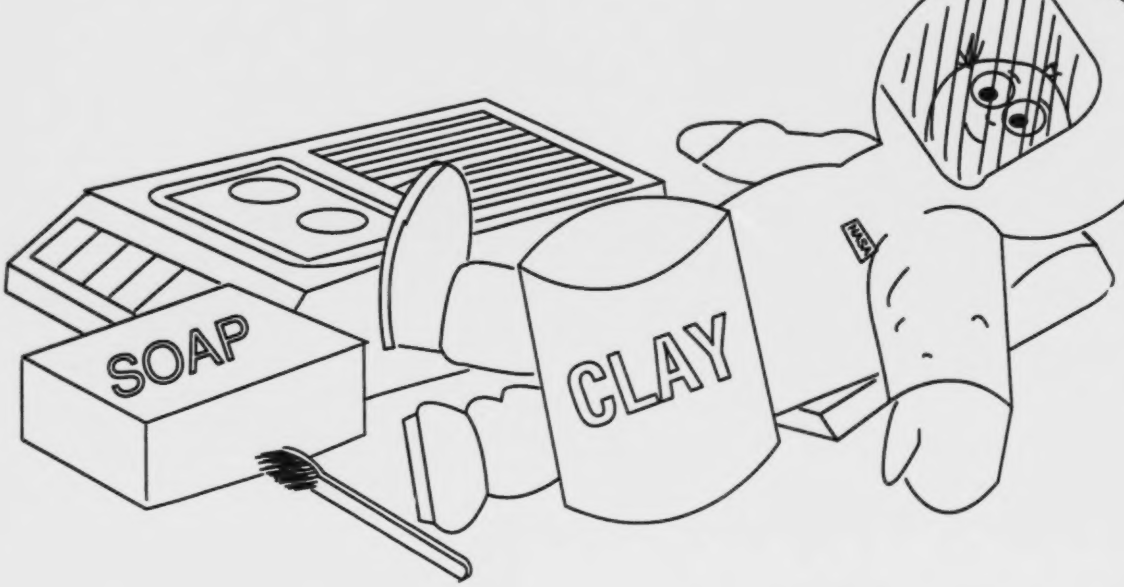
Today, Mario's mother has a surprise. She tells the class that Mario and his friend, Kim, will be going with her into outer space. They will be the first two children in outer space—the youngest astronauts.



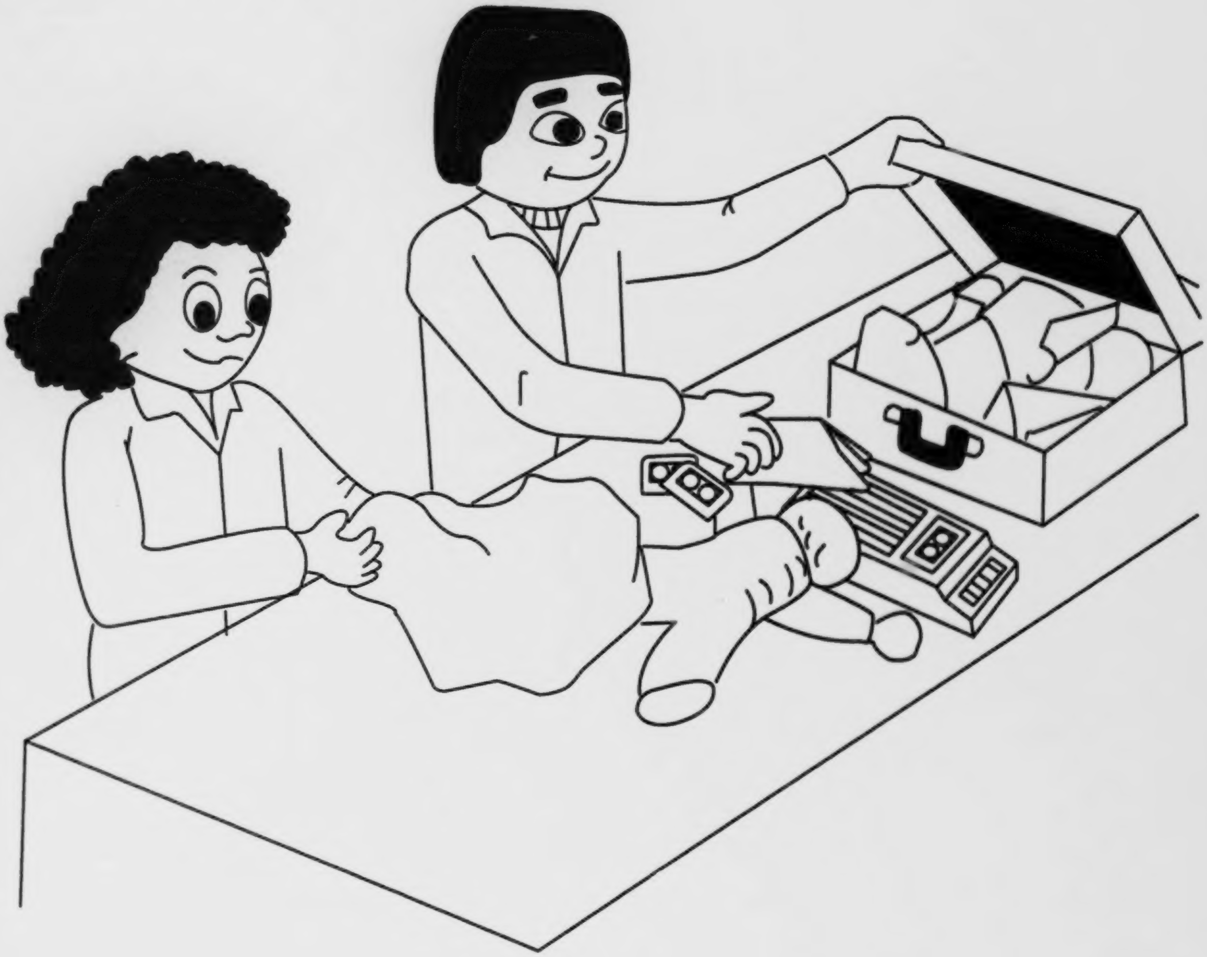
Next, she shows the children the spacesuits Kim and Mario will wear. The boys and girls take turns trying them on. Everyone is proud and happy that Mario and Kim will be the first children in outer space. And, of course, Kim and Mario are thrilled!



Mario's mother shows the children a picture of the space station where the astronaut crew will live. The space station will be home to the commander, the pilot, the mission specialists, a mission doctor and the two youngest astronauts.

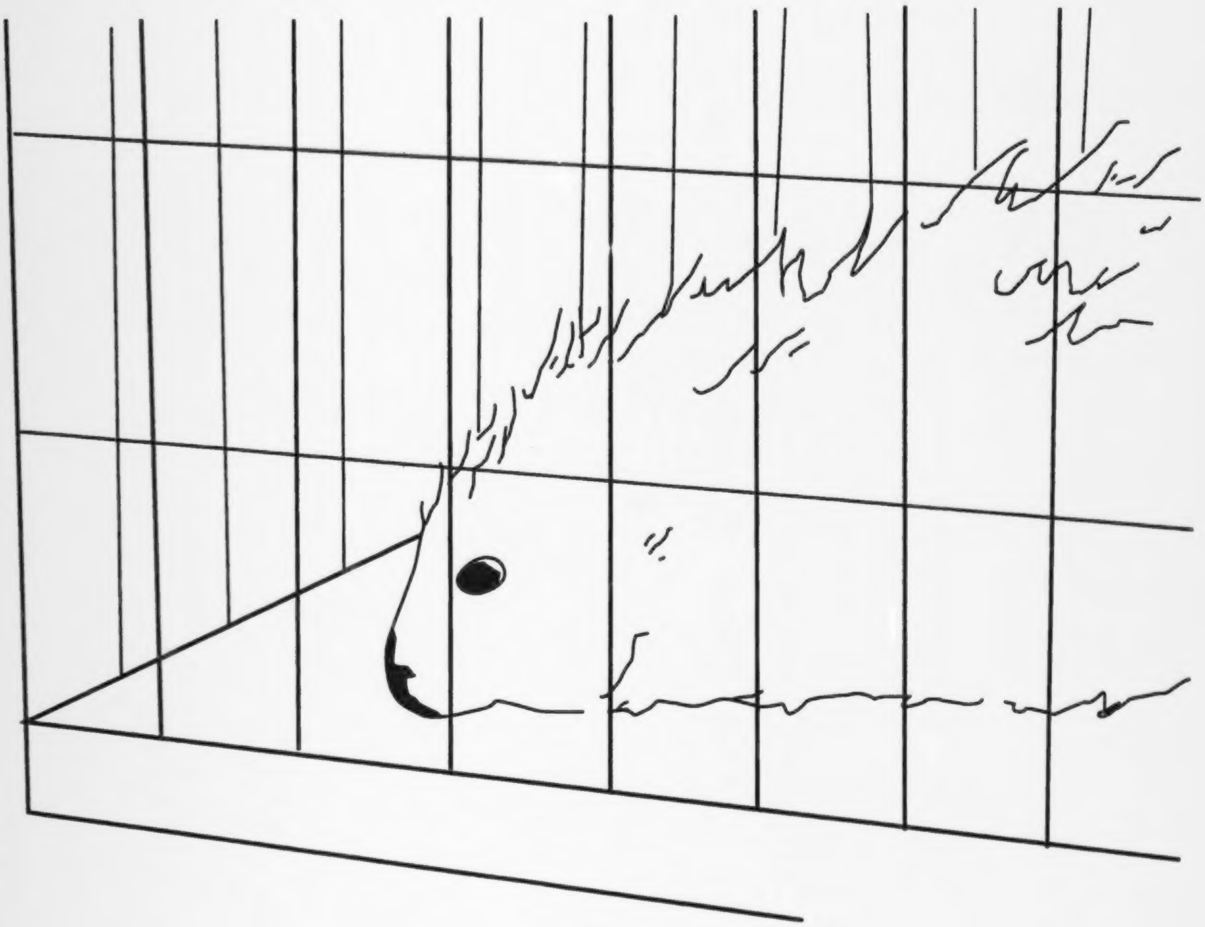


Before Mario's mother leaves school, she tells Mario and Kim they may take along some of their favorite things. But they cannot take heavy things and everything must be small.



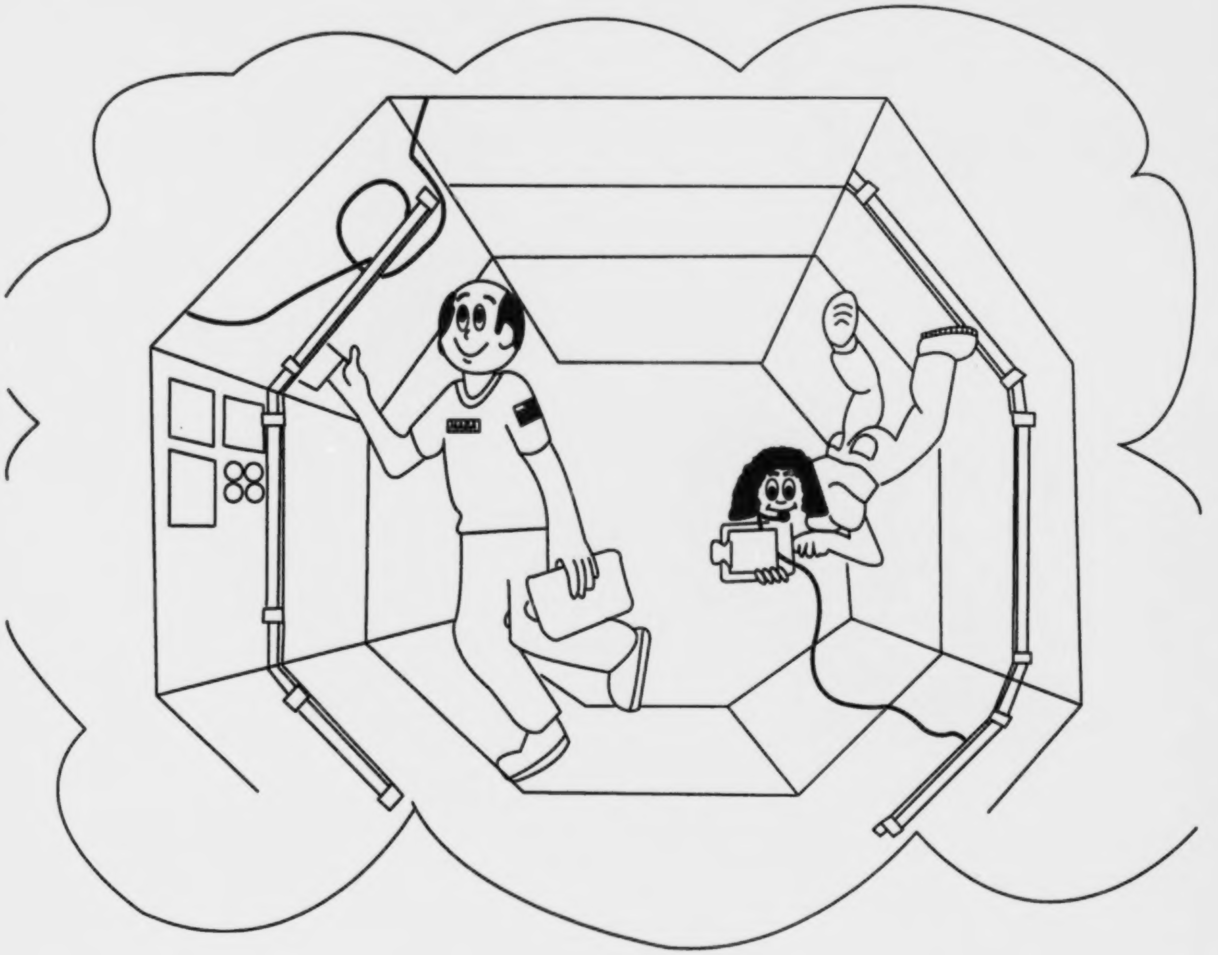
Preparing For Space

Kim decides to take a cassette recorder and some tapes. She would also like to take her doll, but it's too big. Mario wants to take along some clay. Then Kim and Mario talk about what else to take. "Do you have any good ideas?" they ask their friends.



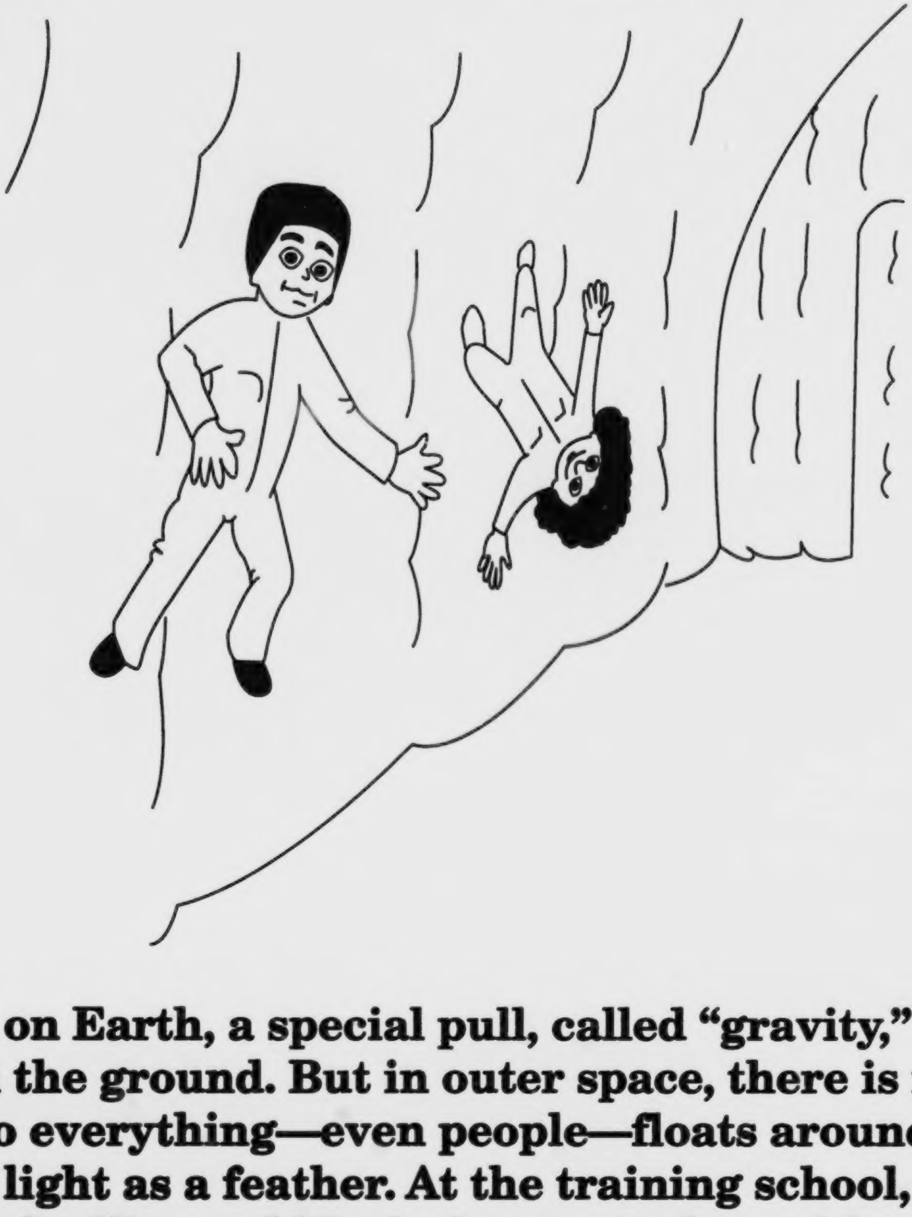
"Take our guinea pig," suggests one of the children. Everyone agrees that Mario and Kim should take Ms. Pig.

"Ms. Pig is going to be the very first 'Pigonaut'," says Kim. Everyone laughs. In a few months, they'll be saying good-bye when Kim, Mario and Ms. Pig join the other astronauts for their exciting trip into outer space.

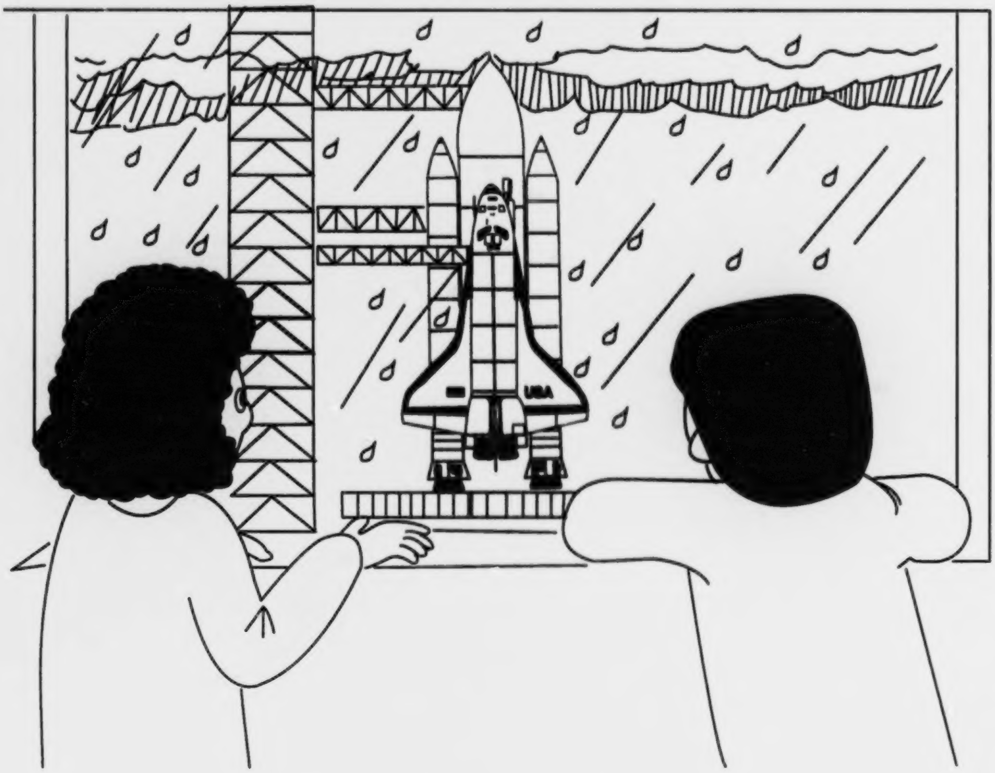


Space School

All astronauts have to go to school before they can ride in the shuttle's orbiter. Mario and Kim will get to learn lots of things before they go to outer space. For three months, they will go to a special training school to practice for their trip. One thing they will learn is how it feels to float in outer space!



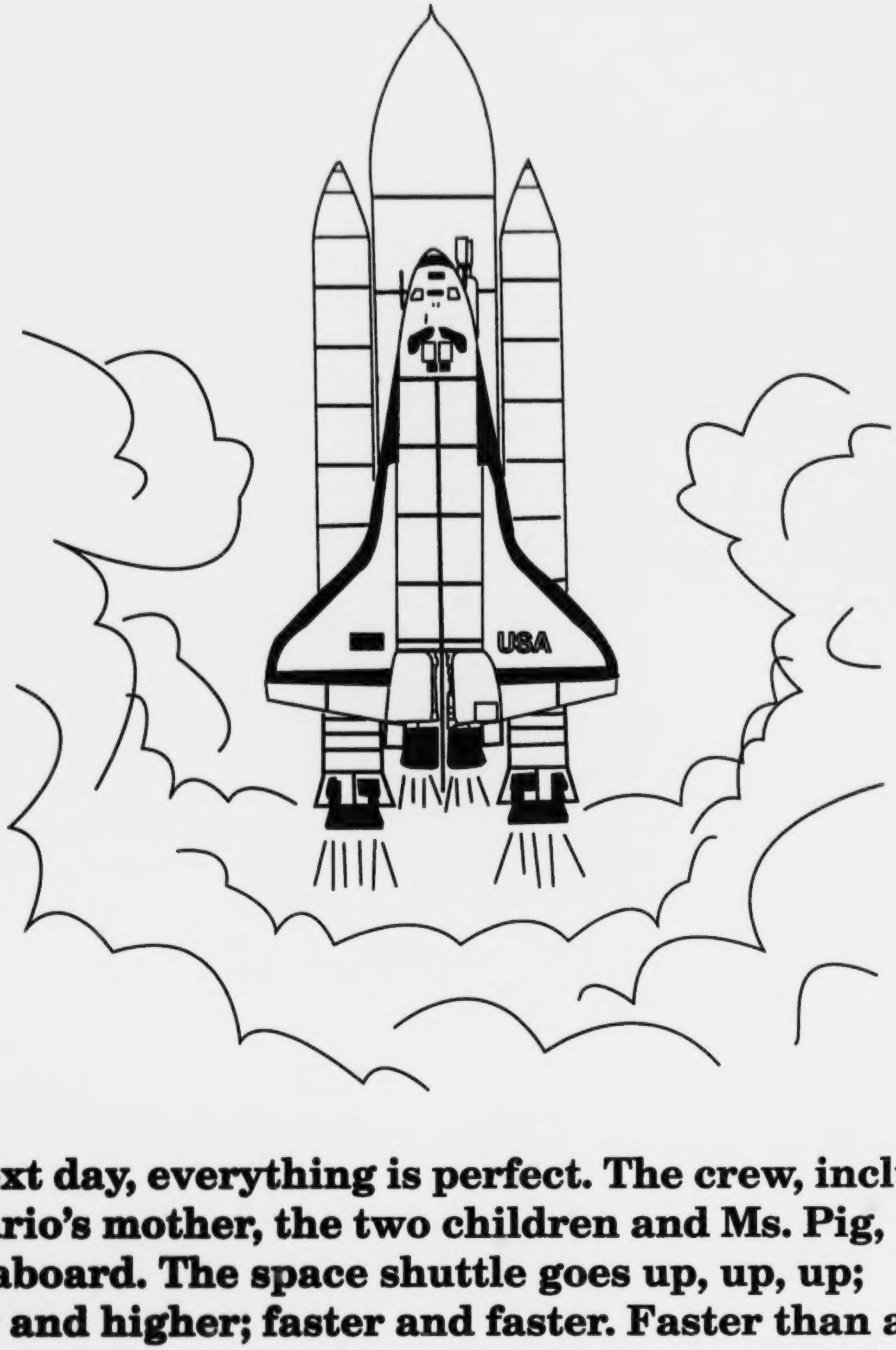
Here on Earth, a special pull, called "gravity," keeps us on the ground. But in outer space, there is no gravity. So everything—even people—floats around as if it were light as a feather. At the training school, a pilot will take Kim and Mario for an airplane ride so they can find out how it feels to float. The pilot will make the plane dive quickly. When the plane dives, the children will float around inside the cabin, just as they will in outer space. During the plane ride, they'll float for about a minute. But in outer space, they will float all the time!



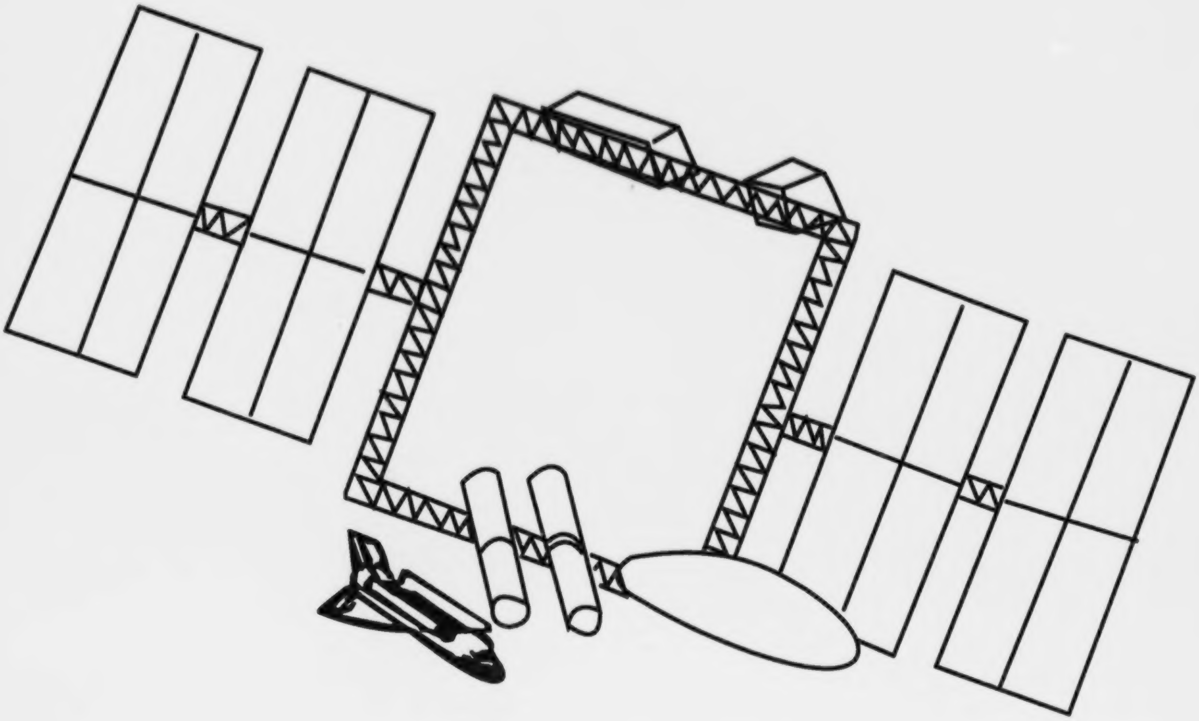
Traveling in Space

Before the space shuttle can leave Earth, everything must be working just right. The rockets and computers and all parts of the shuttle have to work perfectly. The weather has to be good. And the astronauts have to be strong and healthy.

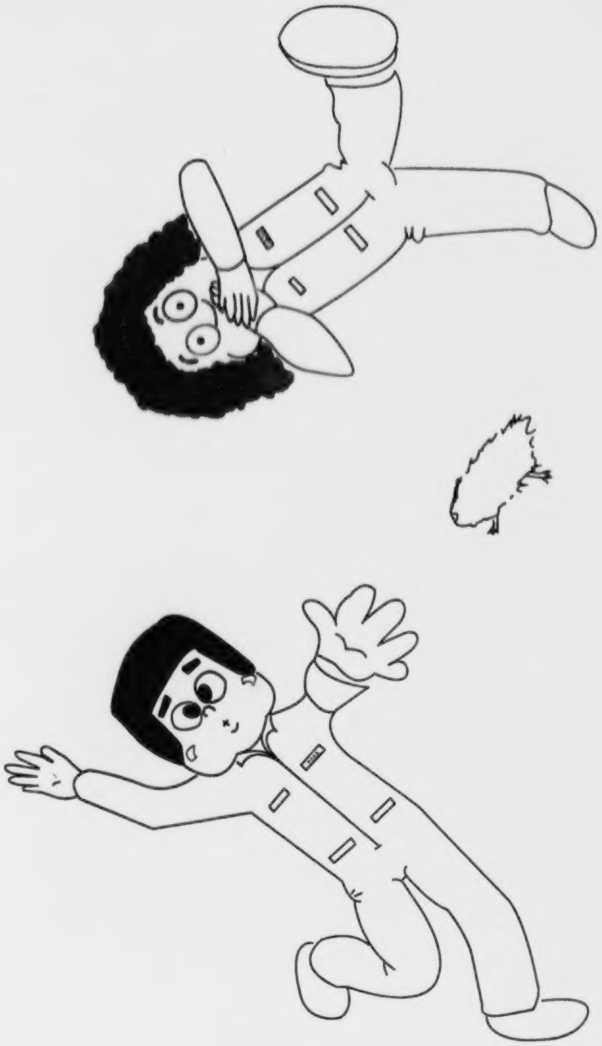
The first time Mario and Kim's space shuttle tries to launch, the weather is bad. The youngest astronauts will have to wait for clear weather to go into outer space. Mario and Kim are disappointed. They want to go now!



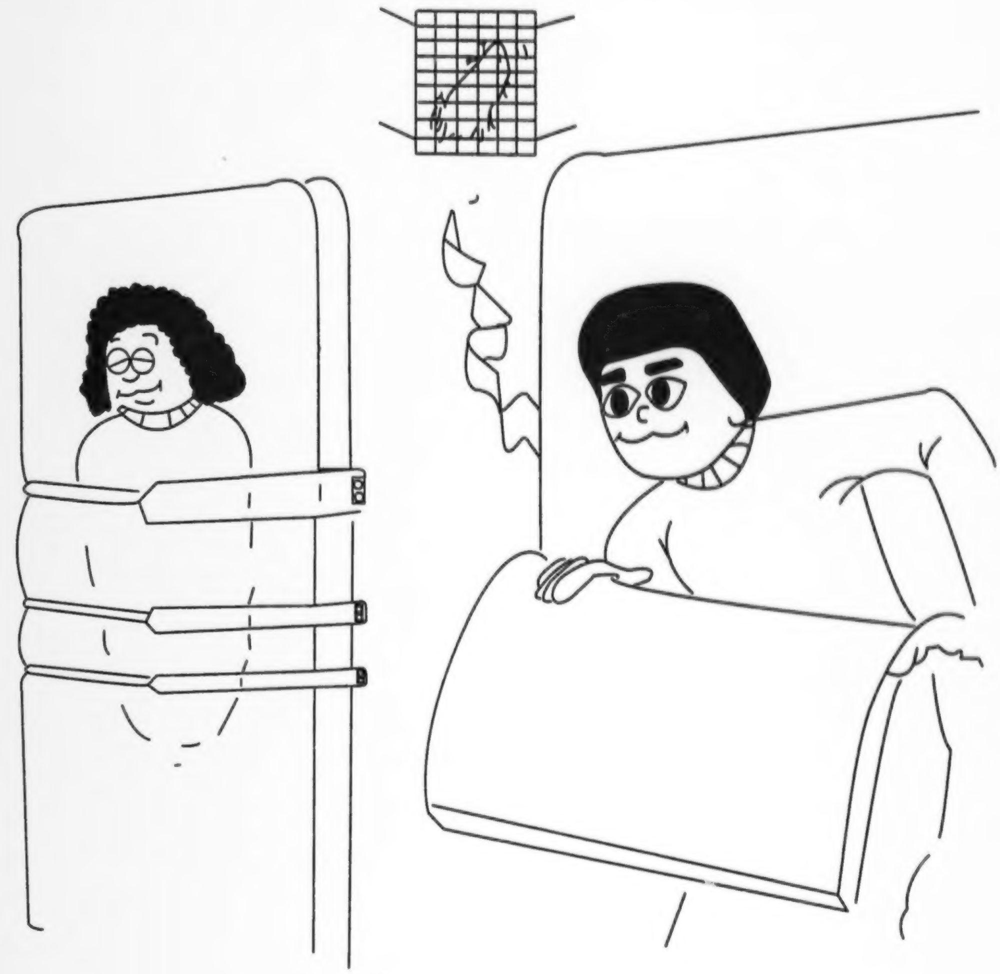
The next day, everything is perfect. The crew, including Mario's mother, the two children and Ms. Pig, climb aboard. The space shuttle goes up, up, up; higher and higher; faster and faster. Faster than a car. Faster than a jet plane. So fast it goes way above our sky, into outer space.



After circling Earth, the space shuttle's orbiter catches up with the space station. Mario, his mother, Kim and Ms.Pig and all the other astronauts leave the orbiter and float aboard the space station.



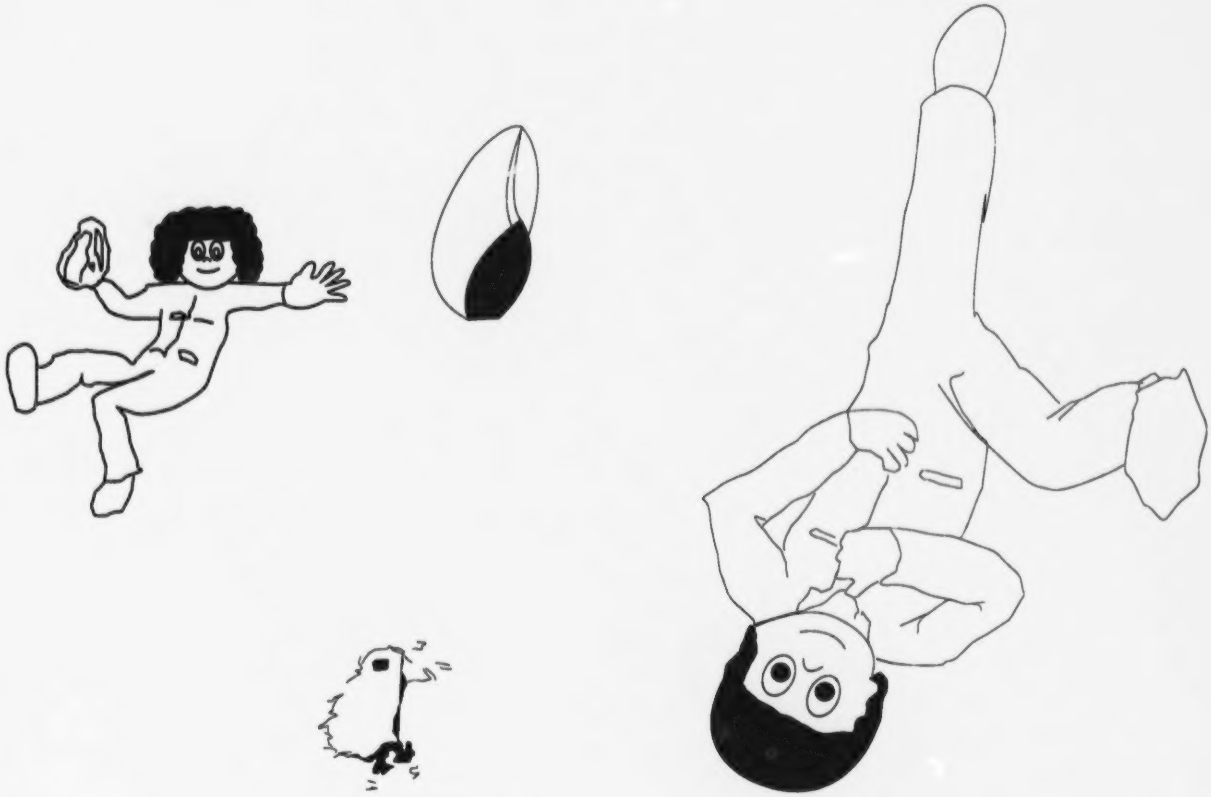
Floating all the time can make you feel funny. At first Kim and Mario feel a little sick. Ms. Pig does not feel very well either.



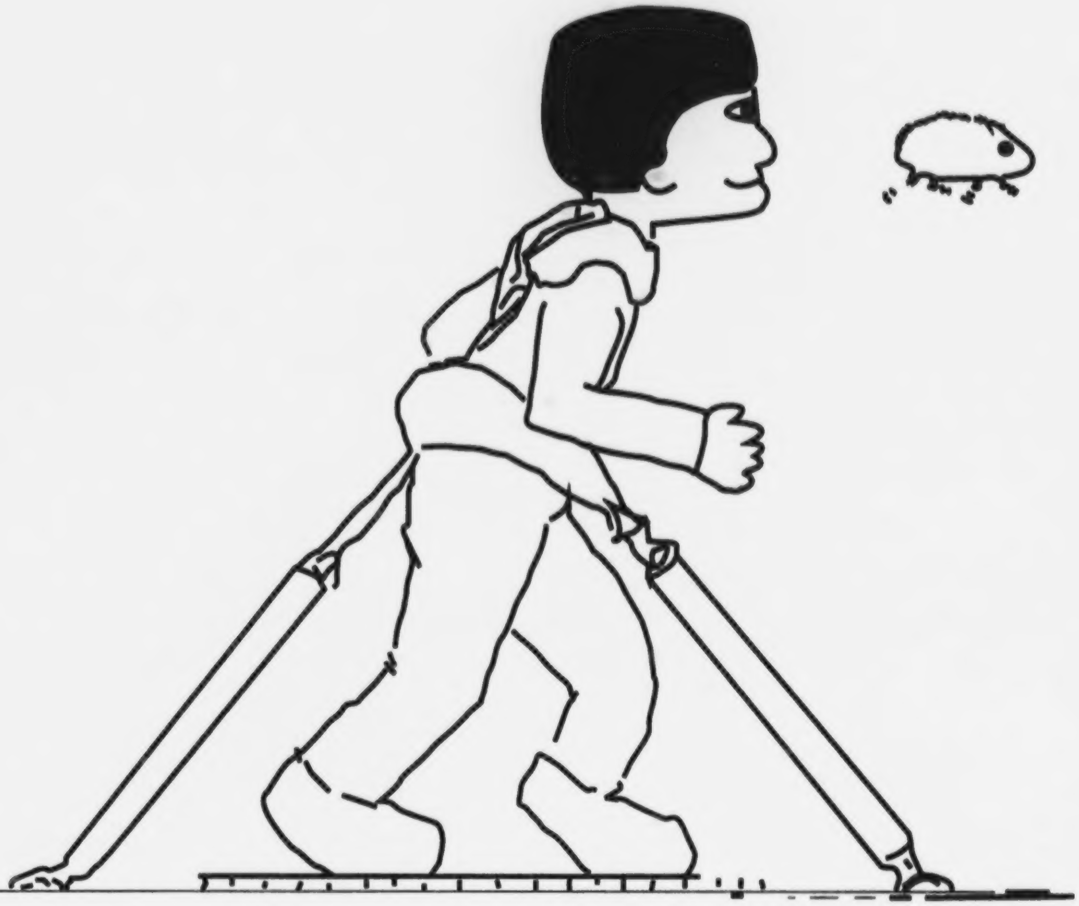
Living in Space

Soon the children feel better and they like their new home.
Many things in outer space are different from Earth.
There is no up.
There is no down.

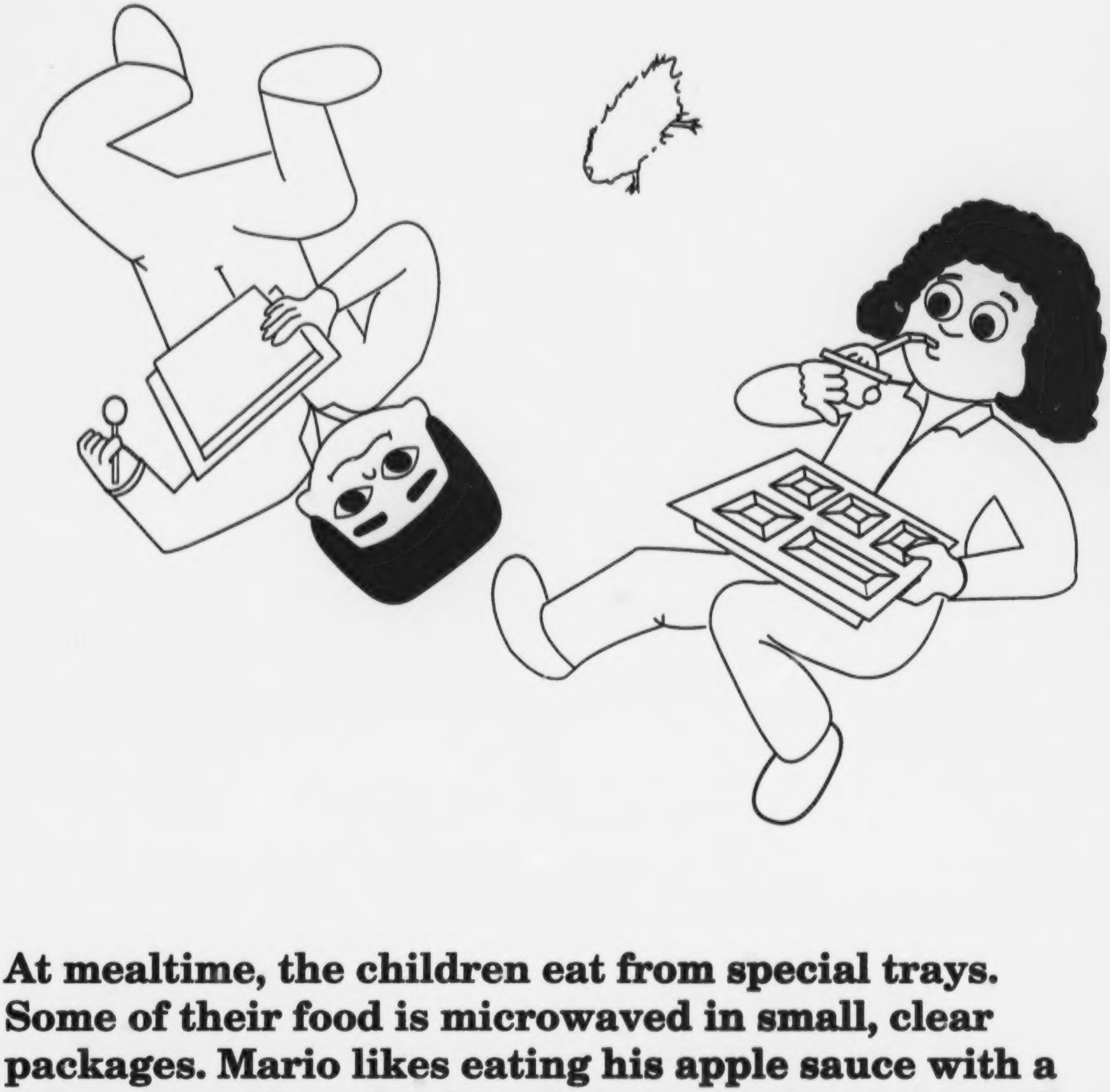
The children float everywhere. To keep from floating around when they sleep, they use sleeping bags with straps. And Ms. Pig's cage is hooked to the wall.



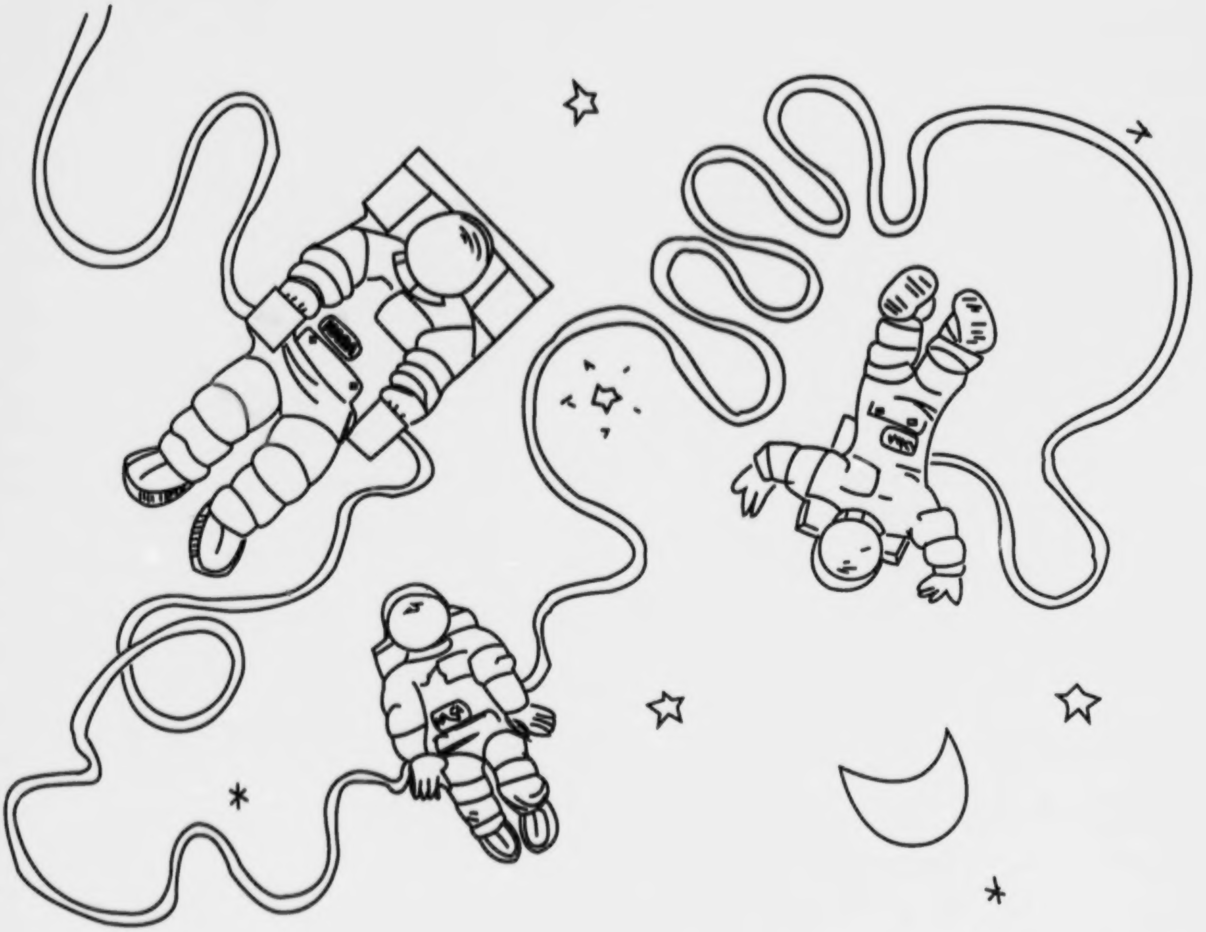
Even getting dressed is tricky. Kim keeps floating off in one direction while her slipper goes in another.



In outer space, walking and stretching every day make people stay healthy.
Mario straps himself on a treadmill where he can walk or run without floating around.
Kim waits for her turn on the treadmill. There is no treadmill for Ms. Pig!

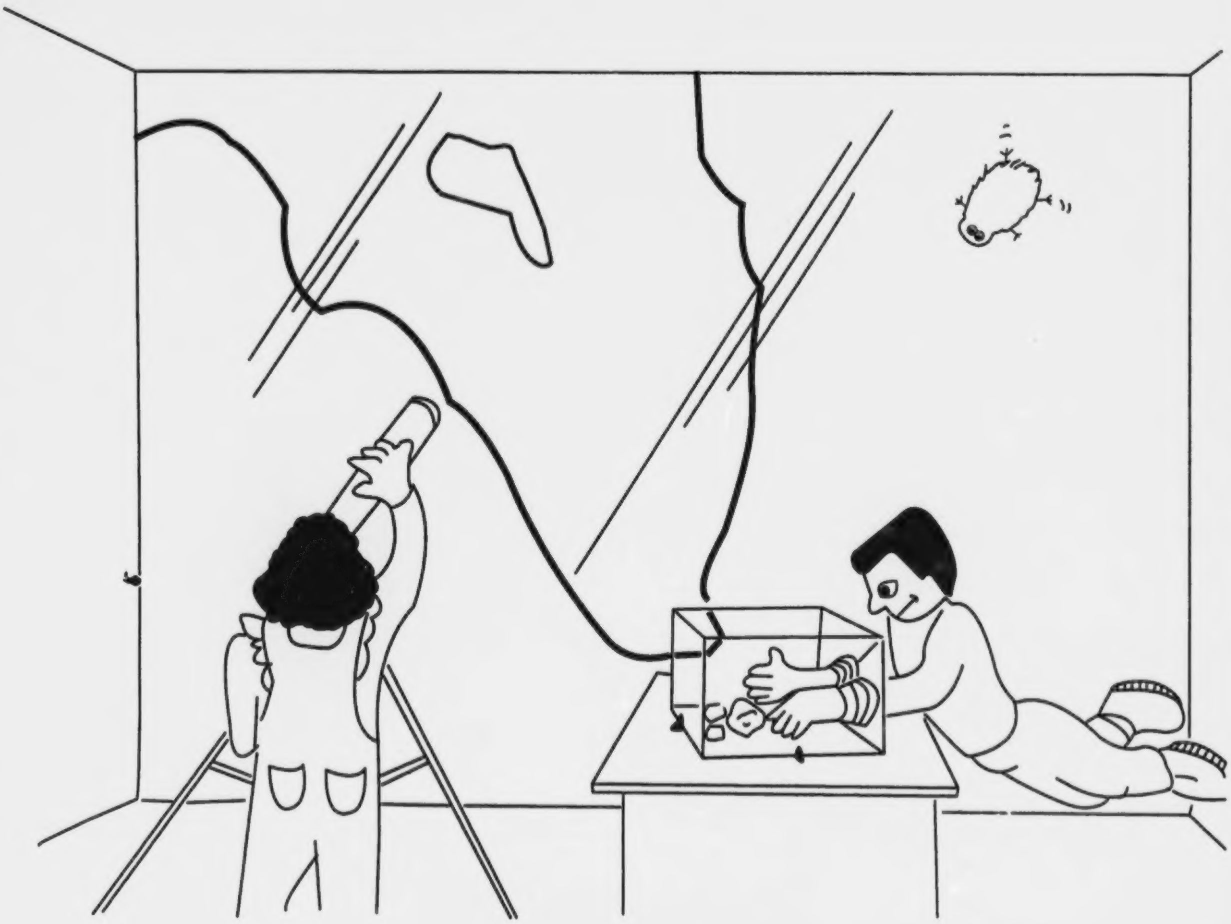


At mealtime, the children eat from special trays. Some of their food is microwaved in small, clear packages. Mario likes eating his apple sauce with a spoon. Kim likes drinking her orange juice through a straw. Ms. Pig likes eating her pellets; she has a big appetite! In fact, she seems to be getting fatter.



Outside the space station, there is no air to breathe. So when ever the astronauts go outside, they must wear spacesuits and carry backpacks that have an air supply. Mario's mother is going outside to fix a weather telescope. Kim and Mario go too.

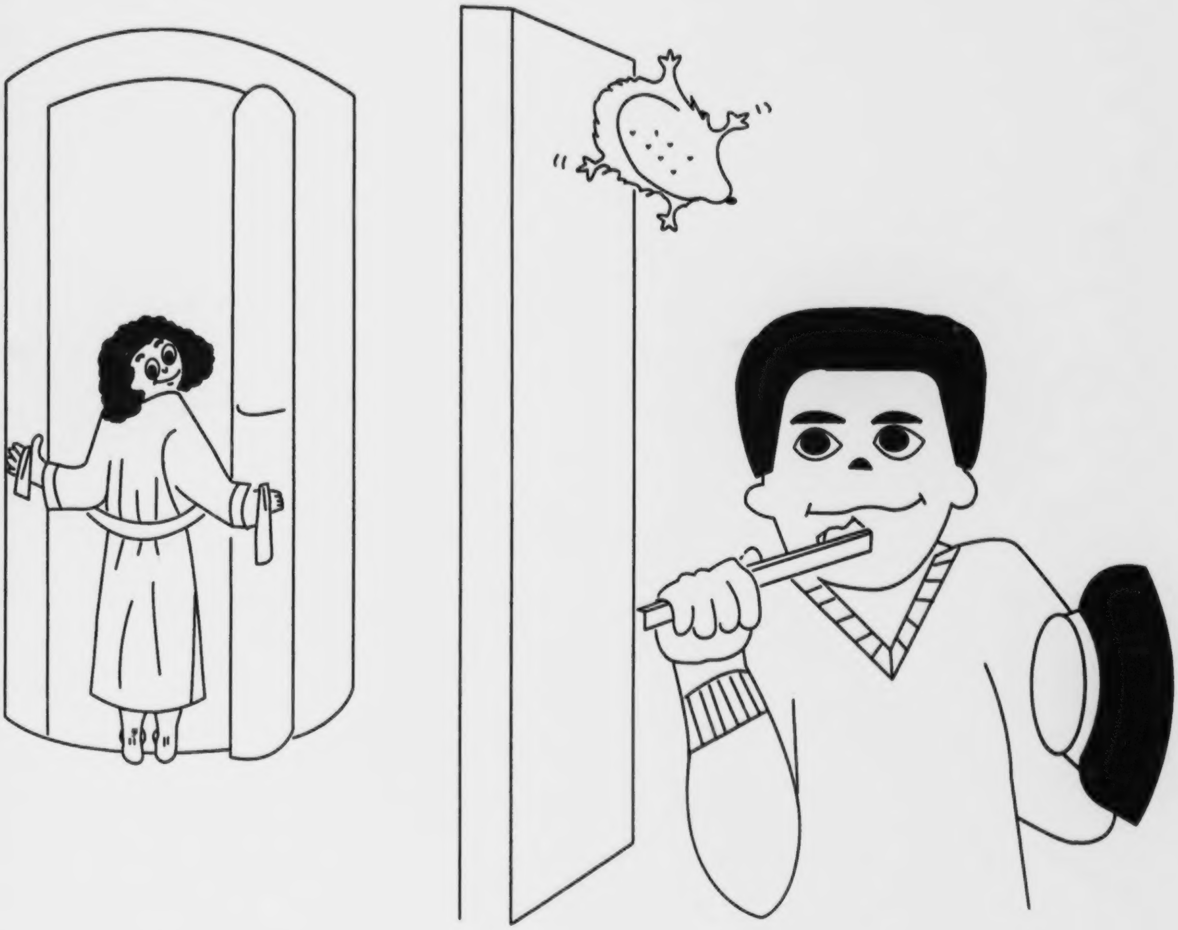
A rope, called a tether, keeps them from floating away.



Studying In Space

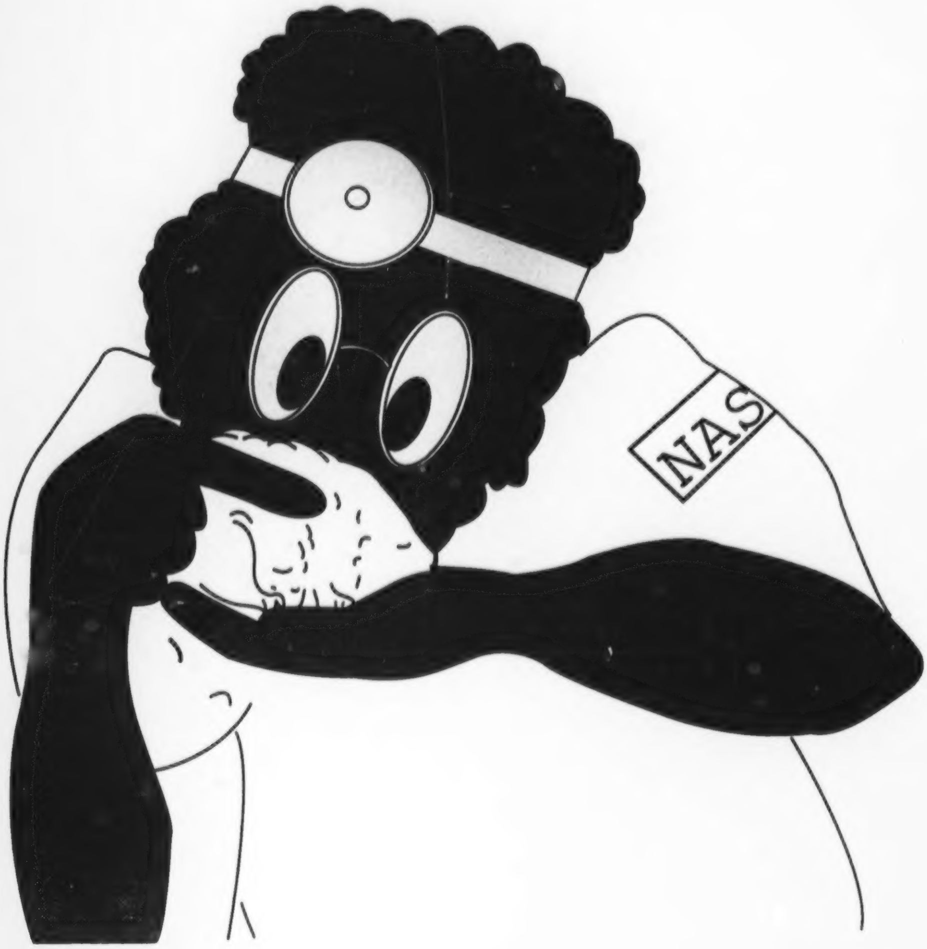
Mario is studying pretty crystals made on the space station. The crystals are inside an experiment box. The box keeps the crystals very clean.

Kim is looking through a telescope. Through it she can study storms, mountains, oceans and lakes on Earth. At night, she can see lights from cities on Earth.



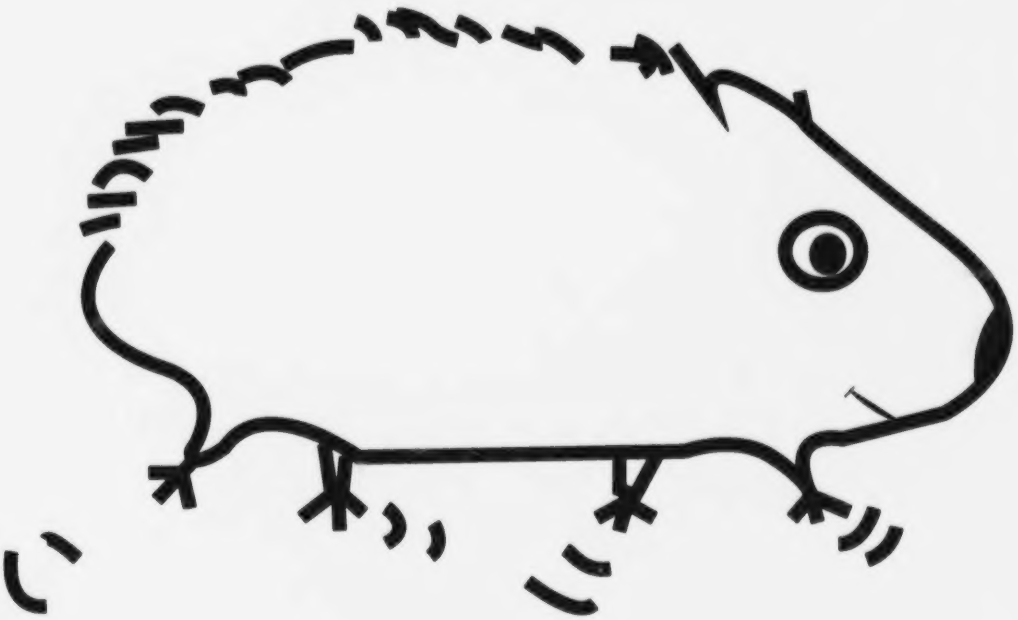
Even in outer space children have to brush their teeth. Mario and Kim use a special toothpaste made to swallow!

They can take a shower, too. The youngest astronauts have to use a little vacuum cleaner to suck up all the water. No water should float around in the space station.

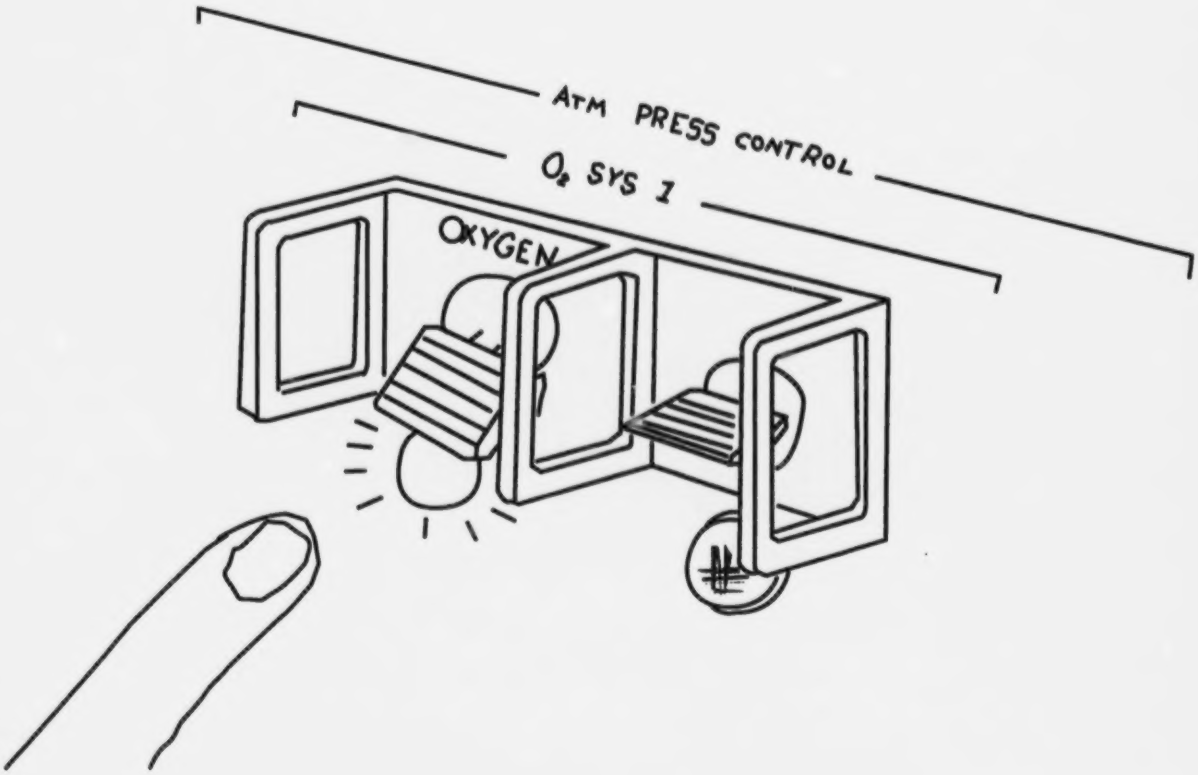


Pigs In Space

The space station doctor is worried about Ms. Pig.
She has been acting strangely.
Now he knows why.
Ms. Pig is going to have babies!



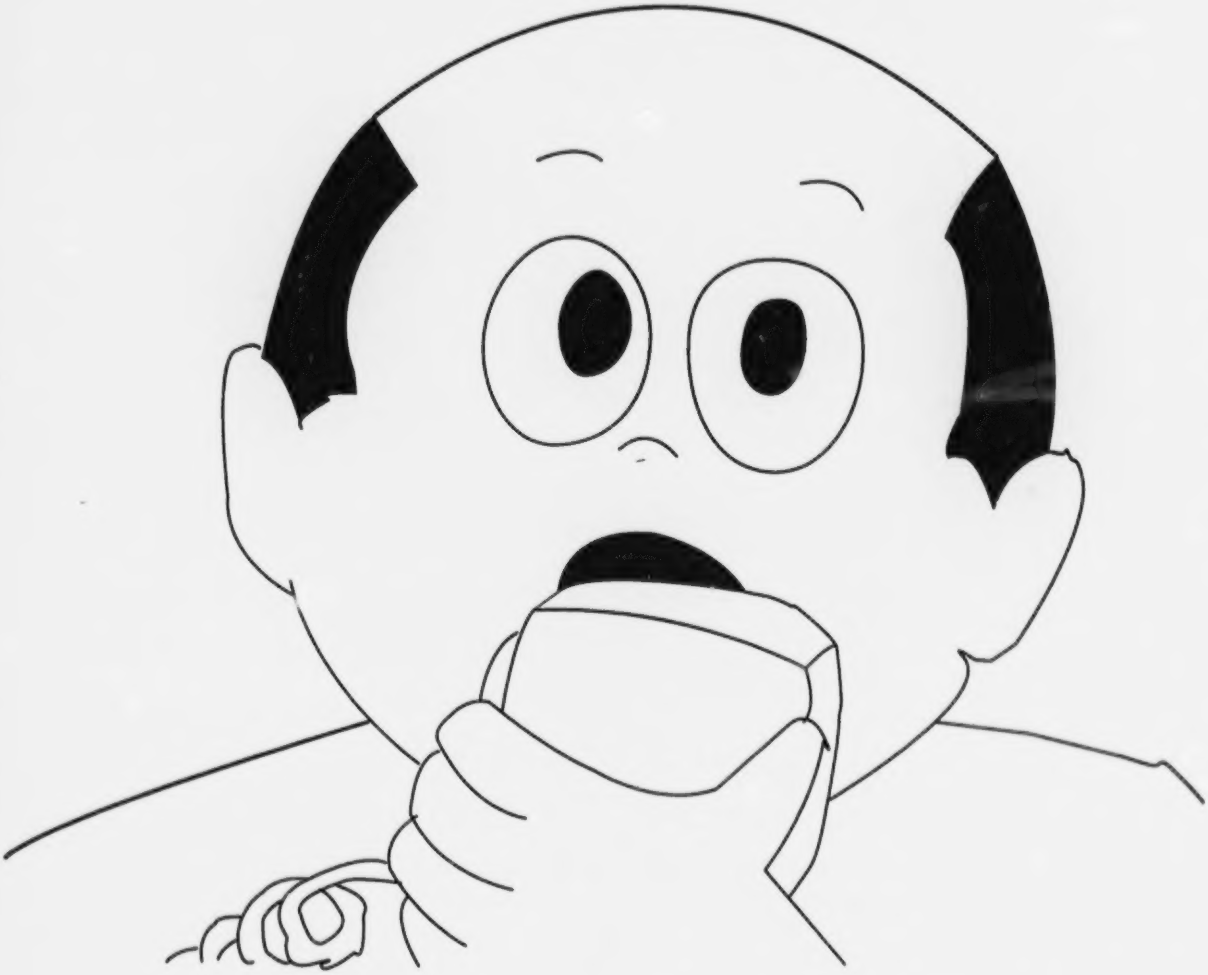
Mario and Kim can't wait to tell their friends back on Earth. Kim says, "Now there will be a whole family of 'pigonauts'!"
Mario says, "These may be the first pigs born in space!"
Ms. Pig just floats around, looking fat and happy.



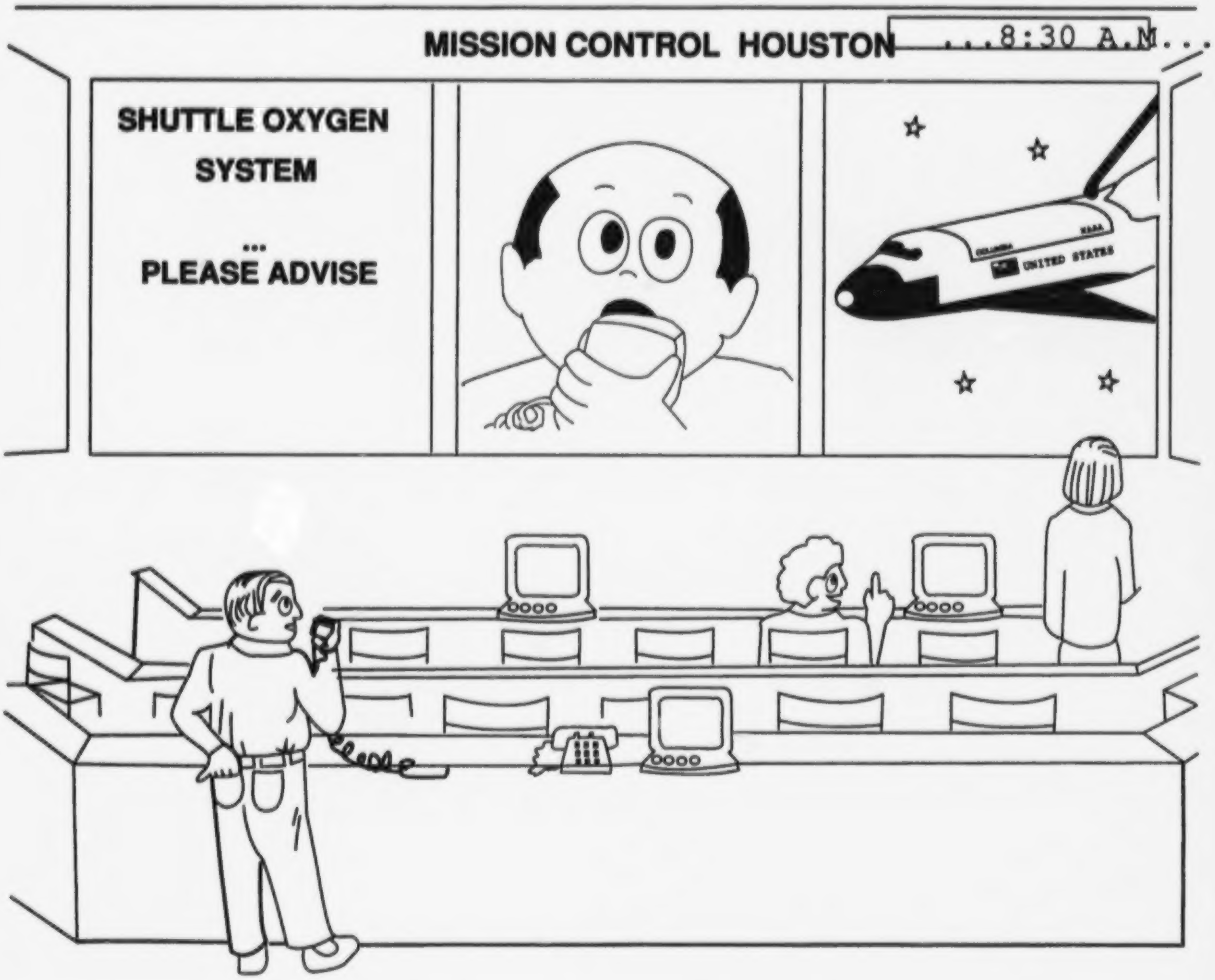
Problems In Space

By now, Kim and Mario are very good astronauts. At the training school, they learned to think fast in an emergency. So far, the problems have all been small. But one day there is a big problem.

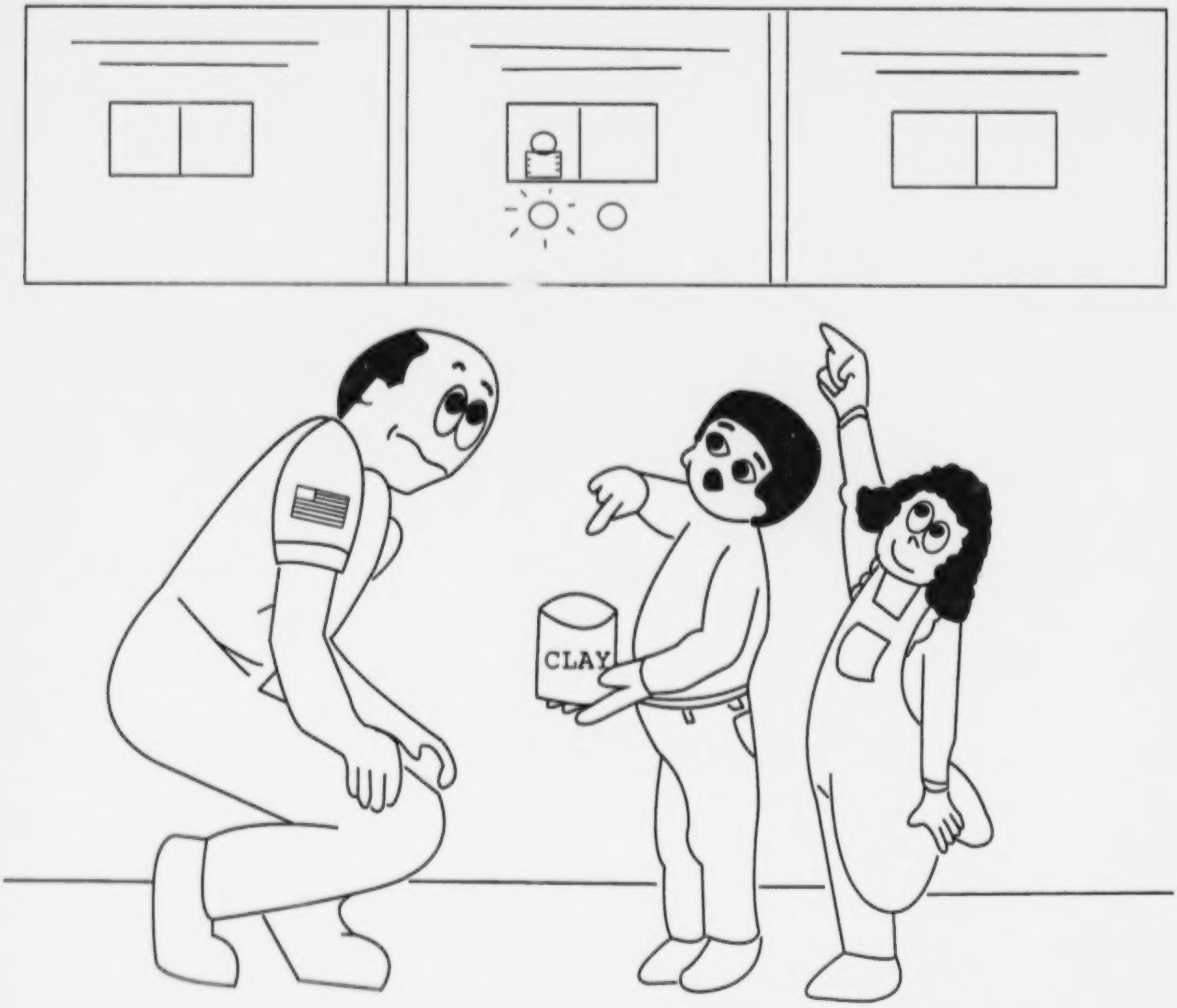
The oxygen supply the astronauts breathe keeps turning off! The switch is broken. If they cannot fix it, everyone will have to leave the space station. But the space shuttle to take them back to Earth is not there. They may be trapped!



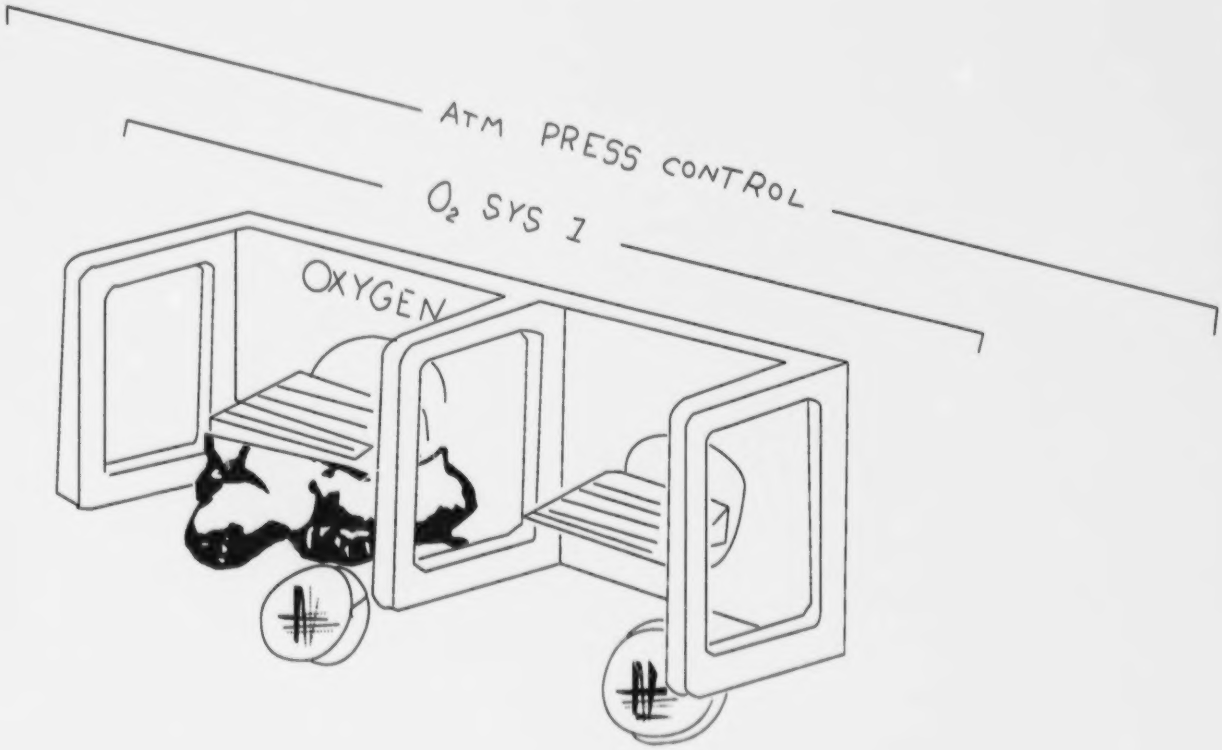
The mission commander radios for help to Mission Control down on Earth.


MISSION CONTROL HOUSTON
...8:30 A.M...
SHUTTLE OXYGEN SYSTEM
...
PLEASE ADVISE
COLUMBIA
NASA
UNITED STATES

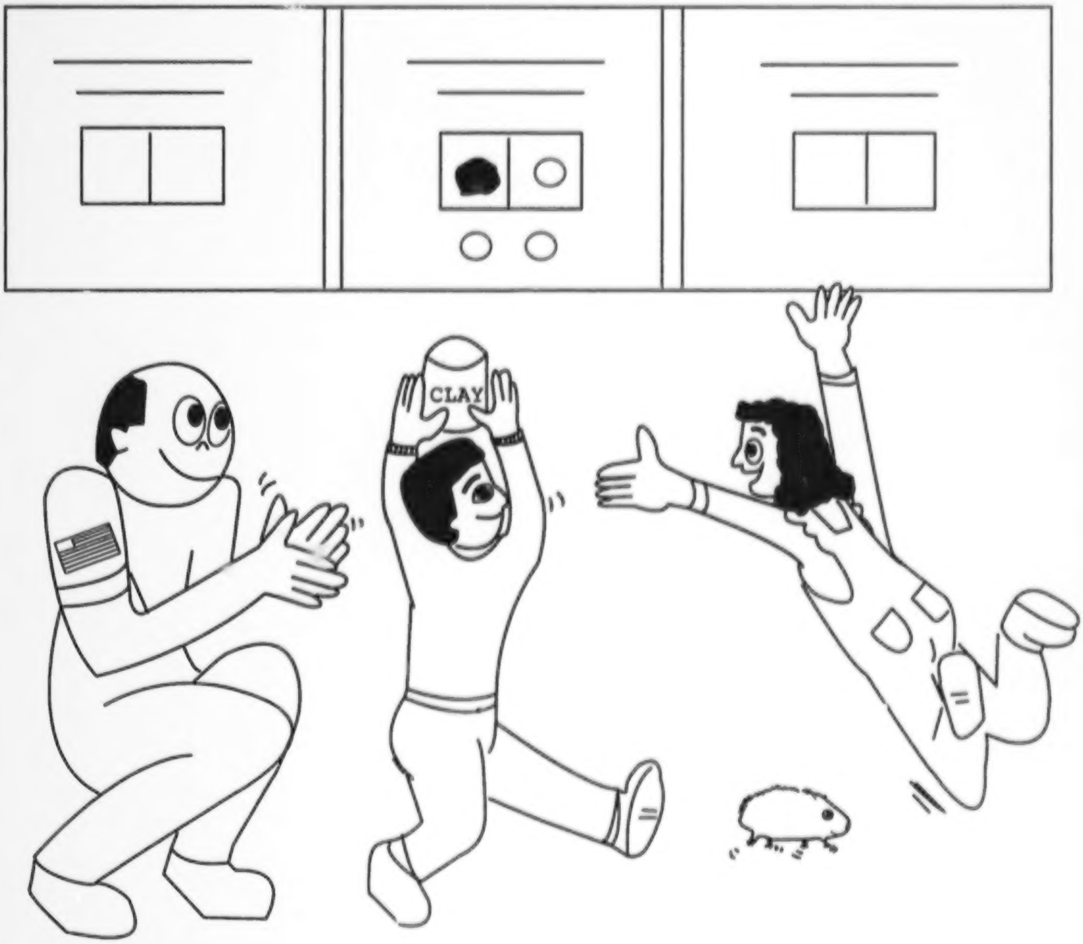
Mission controllers on Earth are trying to think of a way to fix the switch. No switch has ever broken before.



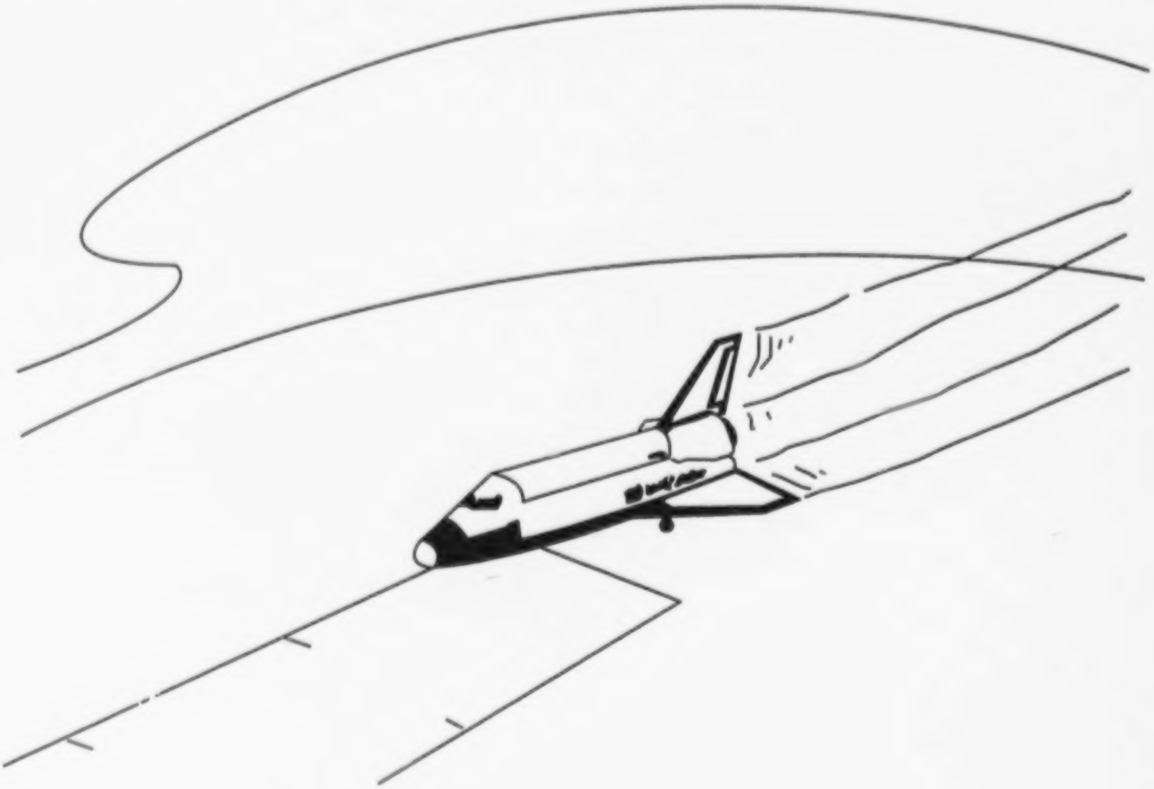
Kim and Mario have an idea.
"Why not put a glob of clay on the switch?" Mario asks.
"The clay will hold the switch open and let the air flow," says Kim.


ATM PRESS CONTROL
O2 SYS 1
OXYGEN

The commander and the children carefully press a ball of clay under the switch.

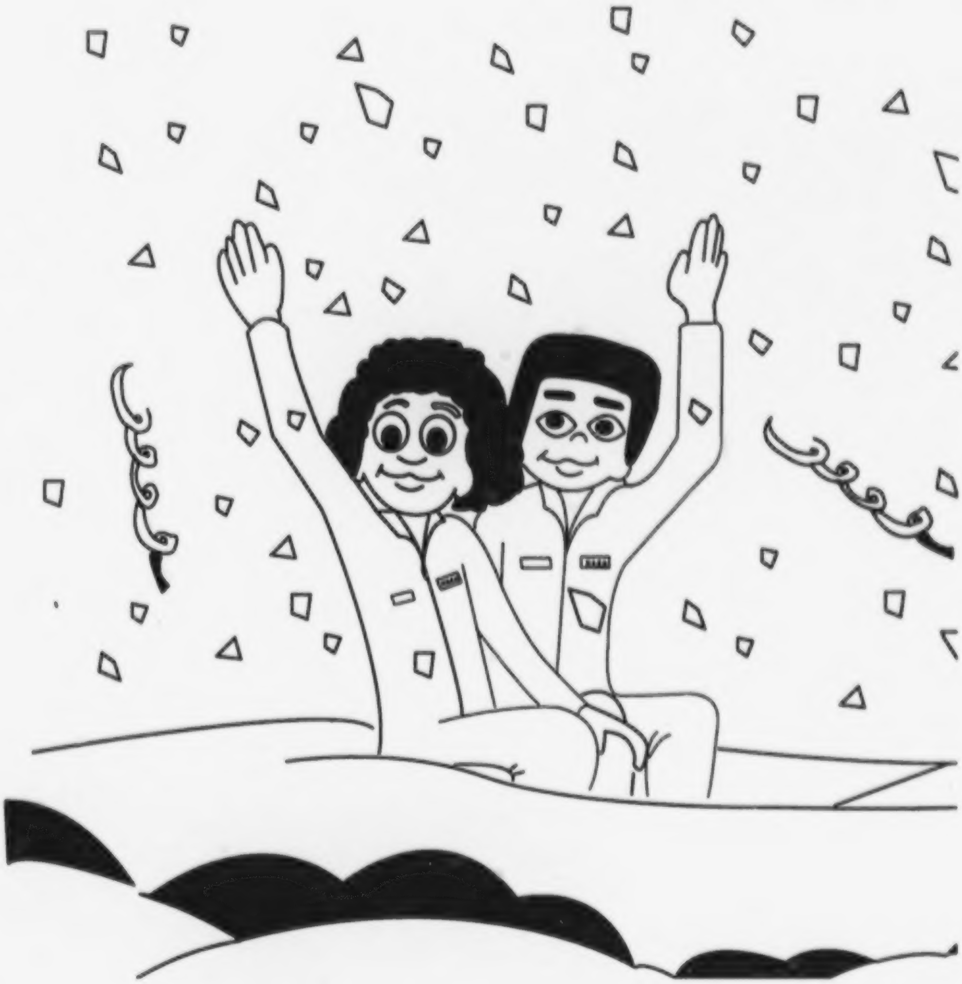


Hurray!
The clay works. The air supply is fixed and all the astronauts are safe.
The commander is very happy.
Mario and Kim are very happy.
Mission Control on Earth is very happy.
Even Ms. Pig is very happy.

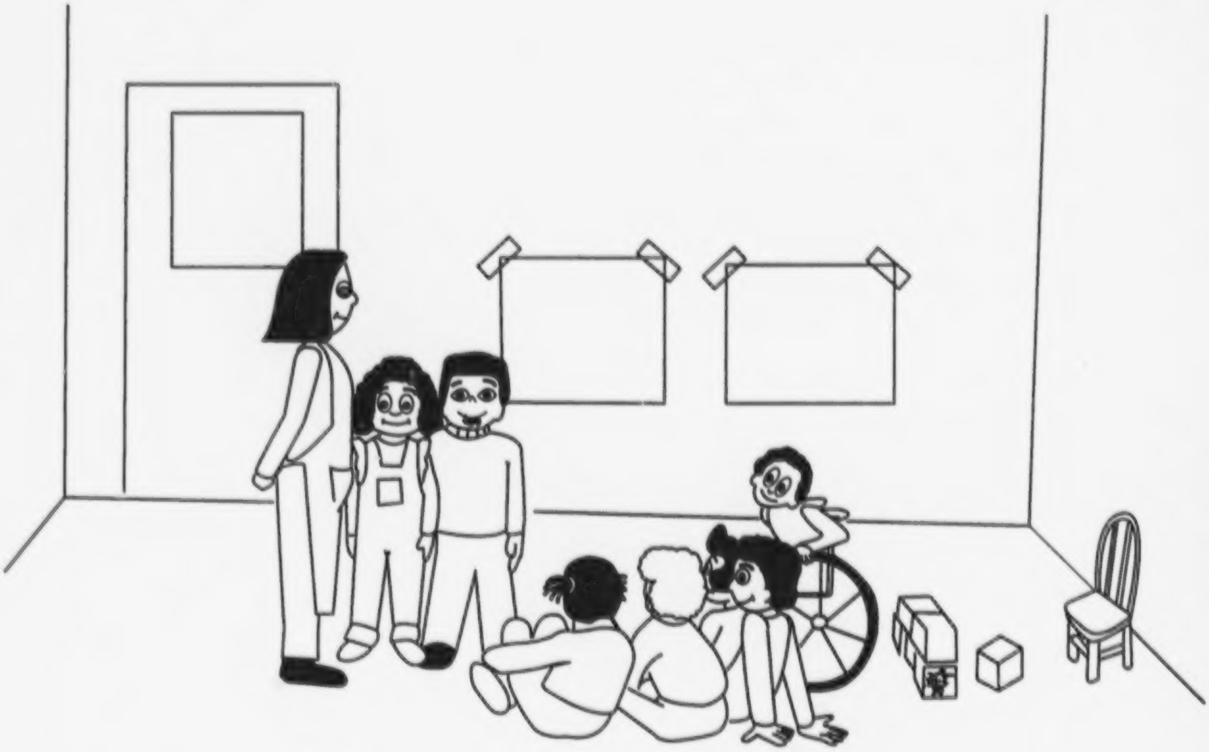


Going Home

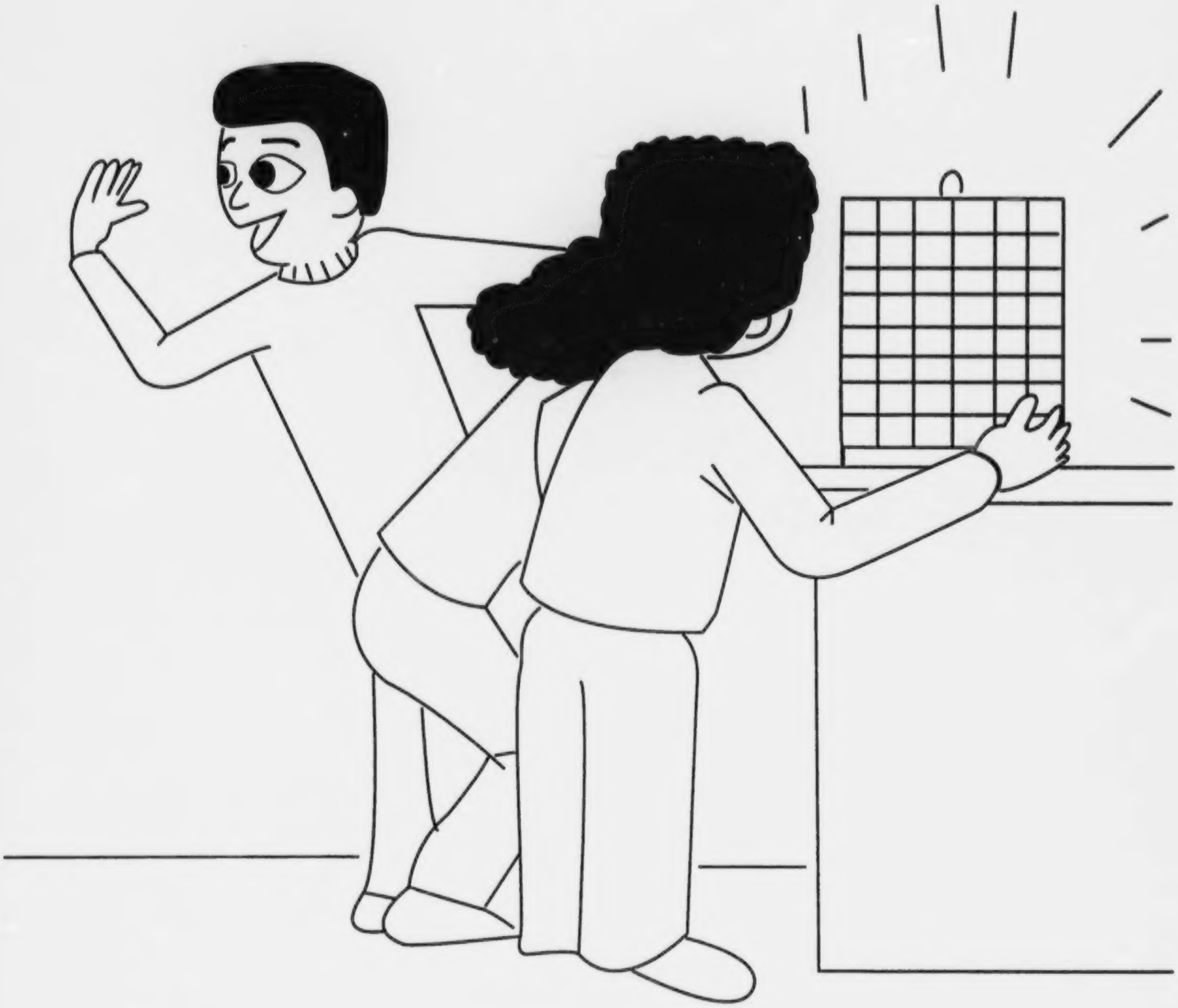
Finally it is time to go back home. Sadly, Mario and Kim leave the space station and board the space shuttle. The shuttle flies back into the sky and glides back to Earth.



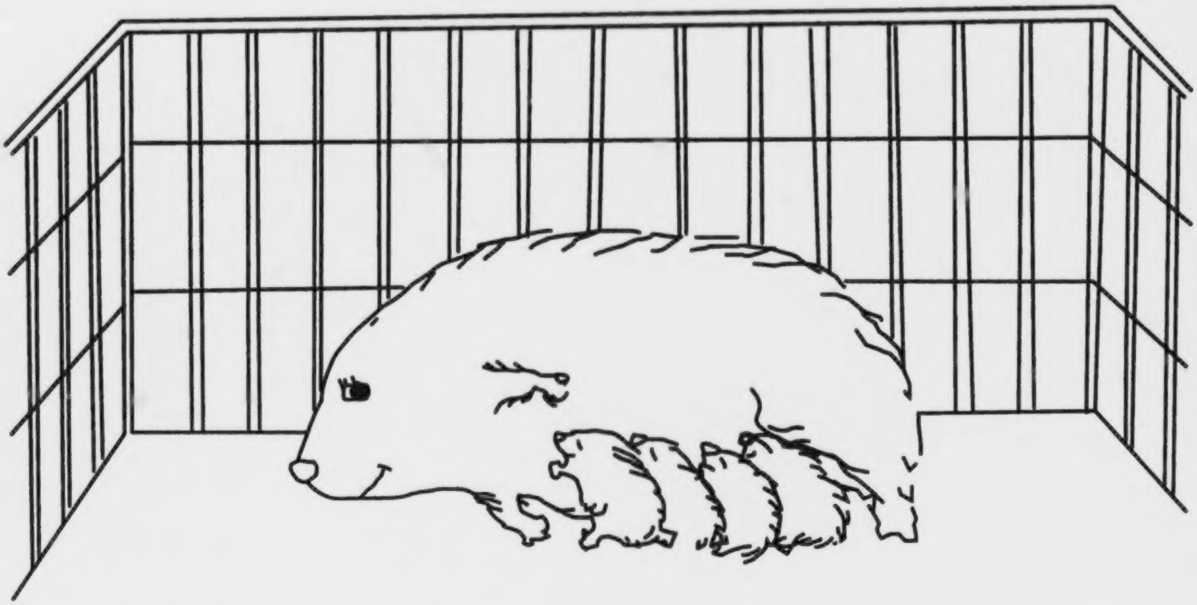
Everyone is happy to see the youngest astronauts. The whole city has a big parade to welcome home their two youngest heroes. Kim and Mario had saved the space station.



Kim and Mario tell their friends at school about their adventures in outer space. Mario says, "We hoped Ms. Pig's babies would be the first guinea pigs born in space."

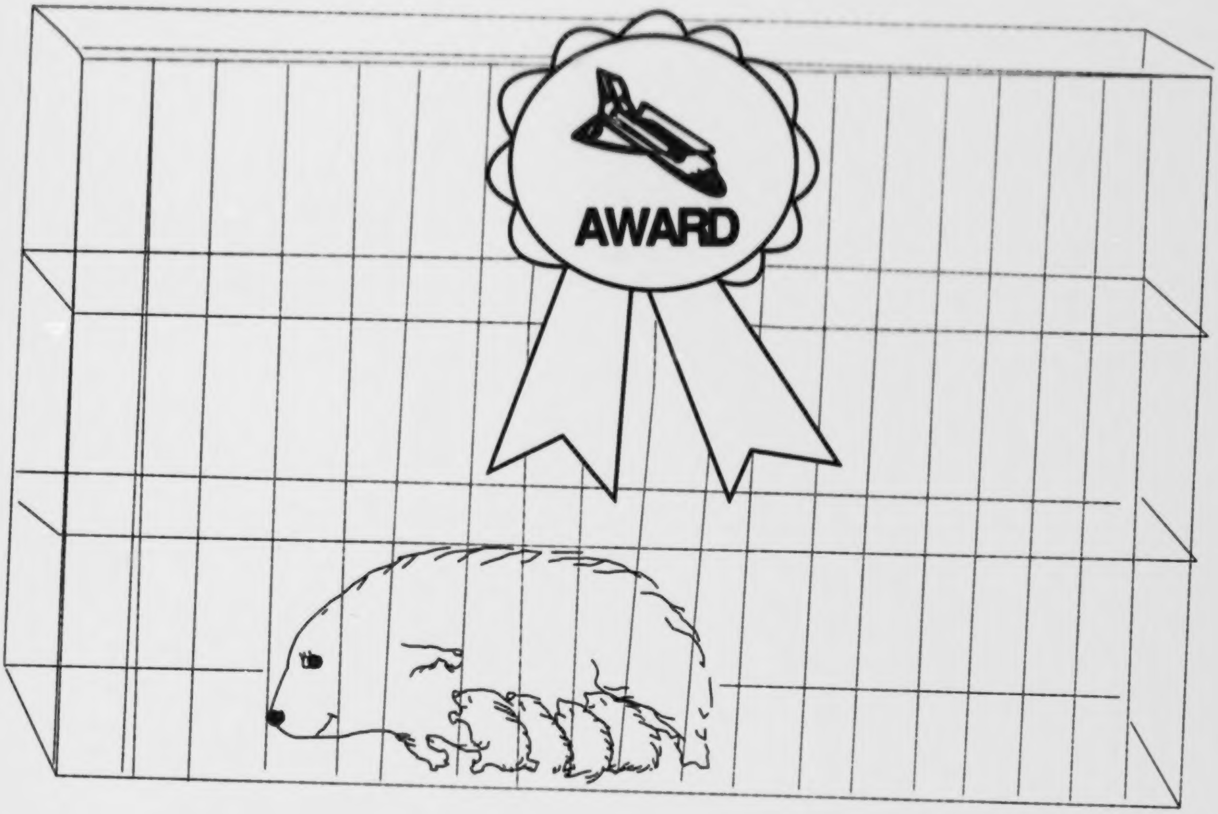


Just then, across the room, there are some strange, little noises.
Everyone runs to Ms. Pig's cage to see what it is.



It is Ms. Pig, all right—and four baby guinea pigs!
"Oh, Ms. Pig,"says Kim, "You deserve an award!"
Ms. Pig seems to agree.

That afternoon, the children work together to make an award for Ms. Pig.
When they finish, they put it on her cage.



Everyone cheers. Ms. Pig just looks happy to have her four feet—and her four babies—back on Earth again.

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